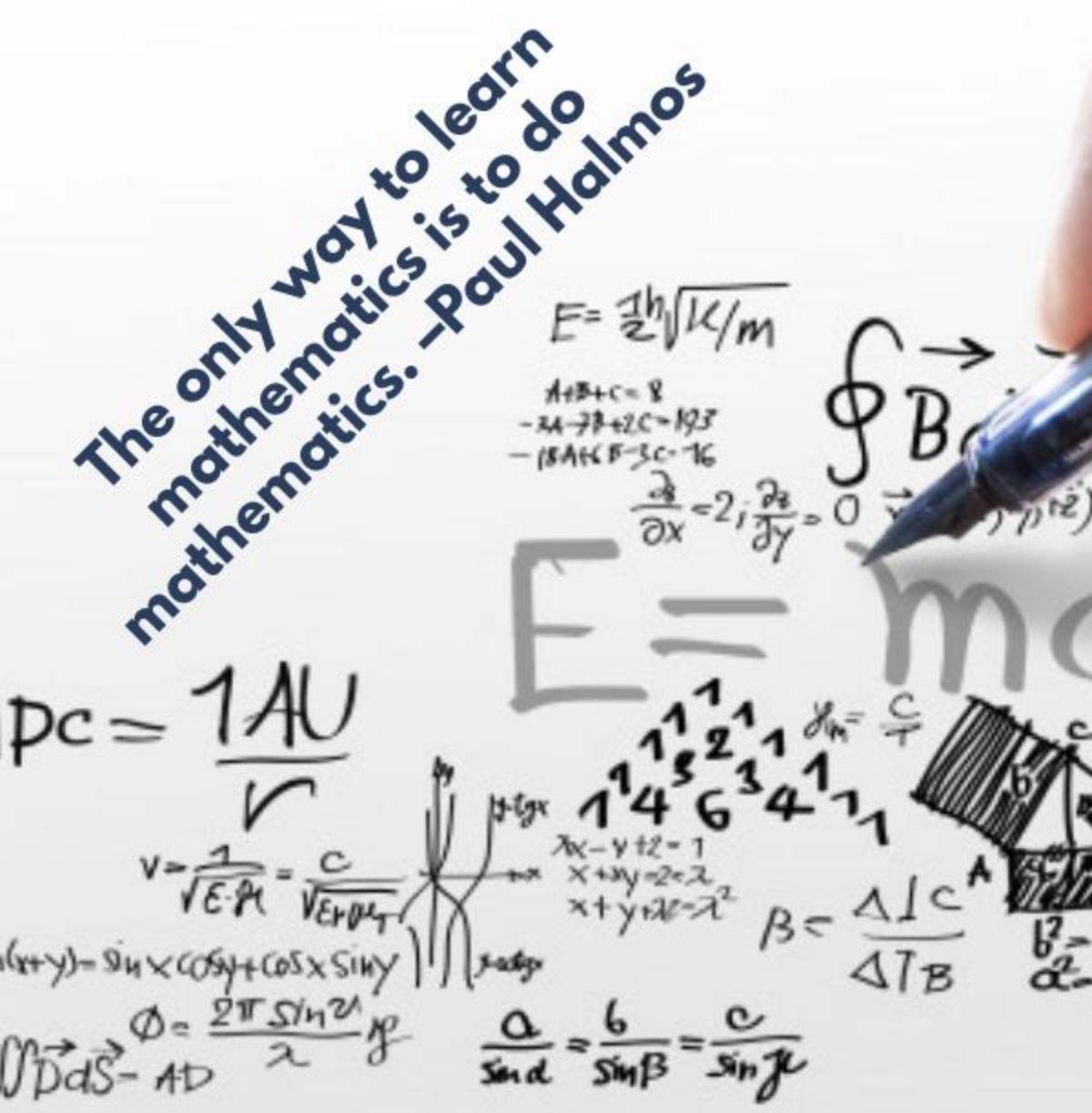
HI-TECH ACADEMY

MATHEMATICS

Compiled EUEE Questions



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GRADE 11 **CHAPTER 1**

Directions: Solve each of the following questions and choose the best answer to the problem from the given alternatives. Write the letter of your choice in capital letter

1. Given $f(x) = ln(x-1)$ and $g(x) = \sqrt{1-2x}$, which one of the following is the domain of (*fog*)?
   A. $\{x \in \Re : x > 1\}$ B. $\{x \in \Re : x \leq \frac{1}{2}\}$ C. $\{x \in \Re : x < 0\}$ D. $\{x \in \Re : x > \frac{1}{2}\}$
2. If $f(x) = \frac{1}{e^x+1}$, then which of the following is equal to $f^{-1}(x)$?
   A. $\ell n(1-x)$- $\ell n(x)$ B. $e^{-x}+1$ C. $\ell n\left(\frac{1}{x+1}\right)$ D. $\frac{1}{e^{-x}+1}$
3. What is the value of $|x| + 2x$ if $x < 0$?
   A. -3*x* B. 3*x* C. –*x* D. *x*
4. If $f(x) = \frac{x+1}{x-1}$ and $f(a) = 5$ then $f(2a)$ is equal to:
   A. 2 B. 4 C. 6 D. 8
5. If $f(x) = \sqrt[3]{1+e^{-x}}$, which of the following is equal to $f^{-1}(x)$?
   A. $\ell n\left(\frac{1}{x^{3-1}}\right)$ C. $\ell n(1-x^3)$
   B. $\frac{1}{\ell n(x^3-1)}$ D. $(1+e^{-x})^3$
6. Which one of the following is the domain of $g(x) = x - \frac{(x^2-1)}{x^4+x}$
   A. $\Re\backslash\{0\}$ B. $\Re\backslash\{-1\}$ C. $\Re\backslash\{0, 1\}$ D. $\Re\backslash\{-1,0\}$
7. Which of the following functions touches but never crosses the x – axis?
   A. $f(x) = 1 - x$ B. $f(x) = x^4 - 1$ C. $f(x) = (x^2-1)^2$ D. $f(x) = x - x^5$
8. If x < 0, then simplest form of $f(x) = \frac{x-|x|}{x}$ is equal to ?
   A. 2x B. 2 C. -2 D. 0
9. If $f(x) = \frac{\sqrt{x+2}}{x+2}$ and g(x) = $\frac{1}{x} - 2$, then $f(g(x))$ *is equal to*
   A. $\sqrt{x} - 2$ B. $\sqrt{x} + 2$ C. $\sqrt{x}$ D. $\frac{\sqrt{x}}{x}$
10. Which of the following functions is a one – to - one correspondence?
    A. $f : \Re' \to \Re$, $f(x)$ = tan x, where $\Re'$ is the domain of f C. $h : [0,\infty) \to [0,\infty)$, $h(x) = x^2$
    B. $g : \Re \to \Re$, $g(x) = 2^x$ D. $r : [0,\infty) \to [0,\infty)$, $r(x) = x+5$
11. The inverse of the function defined by $g(x) = \frac{2x}{x+3}$ is equal to:
    A. $g^{-1}(x) = -\frac{2x}{x-3}$ C. $g^{-1}(x) = -\frac{x+3}{2x}$
    B. $g^{-1}(x) = \frac{3x}{x-2}$ D. $g^{-1}(x) = \frac{x+2}{3x}$
12. If $f(x) = \ln\left(\frac{x}{x-1} + 2\right), for\ x > 1$, then which of the following is the inverse of f?
    A. $g(x) = \frac{e^x-2}{e^x-3}$ C. $g(x) = \frac{e^x}{e^x+1} - 2$
    B. $g(x) = \frac{e^x-2}{e^x+1}$ D. $g(x) = e^{\frac{x}{x-1}} - 2$

13. Which one of the following is the domain of $g(x) = \frac{(x+1)x^{-2}}{x^2+1}$

A. $\Re\backslash\{0\}$ B. $\Re\backslash\{-1,1\}$ C. $\Re$ D. $\Re\backslash\{-1,0\}$

14. Which one of the following is a polynomial of degree 3?

A. $x^3 - 3x^{-1} + 1$ C. $x^2(1-x) + x^3$

B. $3\,x^3 - |x| + 1$ D. $(x-1)^3 + 1$

15. Which one of the following is true about the polynomial? $p(x) = 9 + 4x^6 - (2x^3 - 3)^2$?

A. Its degree is 6 B. The constant term is 18

C. Coefficient of x^6 is 2 D. Leading coefficient is 12

16. Let y = $\frac{e^x+e^{-x}}{2}$. Then an expression of x in terms of y is:

A. $\frac{e^y+e^{-y}}{2}$ B. $\ln\left(y \pm \sqrt{y^2-1}\right)$ C. 2y D. ln2y

17. Which of the following is the inverse of $f(x) = 2 + \ln(x-1)$?

A. g(x)= $2 + e^{x-1}$ C. g(x)= $2 - e^{x-1}$

B. g(x)= $1 + e^{x-2}$ D. g(x)= $1 - e^{x-1}$

18. Which one of the following is a one to one correspondence function from A=[0, 1] to B=[1, 2] ? (2008)

A. $f(x) = x$ **C.** $f(x) = 2x + 1$

B. $f(x) = \frac{1}{3}x^3 + 1$ **D.** $f(x) = x^2 + 1$

19. ***If*** $f: A \to B$ ***and*** $g: B \to C$ ***are functions***, **then which one of the following is true about the composition function? (2008)**

A. Domain of (gof) ⊆ domain of f C. Range of (gof) ⊈ Range of f

B. Domain of (gof) ⊈ domain of f D. Range of (gof) ⊆ Range of f

20. If the point (3,-2) is on the graph of $y = f(x)$, which point is on the graph of $y = f^{-1}(x)$? (2008)

A. (1/3, -2) B. (3, -1) C. (-2, 3) D.(3, -1/2)

21. If $f(x) = \ln(x+1)$ and $g(x) = x^3 + 7$, then what is the domain of $(fog)(x)$? (2008)

A. (-2, ∞) **B. (-1, ∞)** **C. [-2, ∞)** **D.** ∅

22. The inverse of the function $f(x) = 1 + \frac{1}{2}\ln(x-3)$ *is equal to*? (2008)

A. $f^{-1}(x) = -1 + 2e^{x-3}$ C. $f^{-1}(x) = -1 + e^{2(x-3)}$

B. $f^{-1}(x) = 3 + 2e^{x-1}$ D. $f^{-1}(x) = 3 + e^{2(x-1)}$

23. **Which one of the following is a one to one correspondence?(2009)**

A. $f: [0,\infty) \to \mathcal{R}$ *defined by* $f(x) = |x|$

B. $f: \mathcal{R} \to [0,\infty)$ *defined by* $f(x) = x^2$

C. $f: \mathcal{R} \to [0,\infty)$ *defined by* $f(x) = 3^x$

D. $f: [0,\infty) \to \mathcal{R}$ *defined by* $f(x) = \log_2 x$

24. If $f(x) = \sqrt{x^3}$ *and* $(fog)(x) = \sqrt[4]{x}$, *then what is the value of* $g(8)$? (2009)

A. $\sqrt[3]{2}$ B. 2 C. $\sqrt{2}$ D. $2\sqrt{2}$

25. **Which one of the following is the inverse of $f(x) = 8x^3 + 2$? (2009)**

A. $f^{-1}(x) = \frac{1}{8x^3+2}$ C. $f^{-1}(x) = 8x^{-3} - 2$

B. $f^{-1}(x) = \frac{1}{2}\sqrt[3]{x-2}$ D. $f^{-1}(x) = \frac{1}{8}\sqrt[3]{x-2}$

26. Which one of the following is true about signum, absolute value and greatest integer fuctions? 2010

A. $sgn(x) = \pm|x|, for\ all\ x \in R.$ C. $xsgn(x) = |x|$

B. $sgn(x) \leq \lfloor x \rfloor, for\ all\ x \leq 0$ D. $sgn(x) \leq \lfloor x \rfloor, for\ all\ x \geq 0$

27. Let $f(x) = x - x^2\ and\ g(x) = \frac{1}{x}$. then what is $g\left(f\left(\frac{1}{x}\right)\right)\ equals\ to$ (2010)

A. $x - x^2$ B. $\frac{x^2}{x-1}$ C. $\frac{1}{x^2-x}$ D. $\frac{x-1}{x^2}$

28. vblf $f(x) = ax - b\ and\ f^{-1}$(x+1) = $\frac{1}{2}x + 2, for$ each $x \in \Re$, then what must be the value of $a\ and\ b$?

A. $a = ½,\ \ b = -2$ C. $a = 1,\ \ b = 1$

B. a= 2, $\ \ b = 2$ $D.\ a = 2,\ \ b = 3$

29. If f is the greatest integer function and g is the absolute value function, then what is the value of $(f \circ g)\left(\frac{3}{2}\right) + (g \circ f)(-\frac{4}{3})$?

A. 1 B. 3 C. -1 D. 2

30. Which one of the following is equal to $f(x) = \sqrt{(x+4)^2}\ for\ every\ x \in k$

A. $g(x) = x + 4$ $B. g(x) = x + 2$ $C. g(x)|x + 4|$ $D. g(x) = |x| + 4$

31.

CHAPTER 2

32. What is the solution set of $\frac{2}{x} - \frac{x-2}{x^2-2x} = 1 - \frac{2x-2}{3x-2}$?

A. { 1, -2} B.{1, 2 } C. {-1} D. {1}

33. Which one of the following functions has NO vertical asymptote?

A. $f(x) = \ell n(x + 1)$ B. $f(x) = \frac{x^2+1}{x^3+8}$ C. $f(x) = \frac{x^2-9}{x-3}$ D. $f(x) = \frac{x-1}{x^2-x}$

34. Which one of the following is true about the graph of $f(x) = \frac{x^2-1}{x-x^2}$?

A. $x = 0$ and $x = 1$ are its vertical asymptote

B. $y = 1$ is its horizontal asymptote

C. $y = x - 1$ is its oblique asymptote

D. It is almost the same as the horizontal line y = -1 as $x \to \pm\infty$

35. What is the solution set of $1 - \frac{5}{x^2+4} = \frac{x-1}{x^2-x} + \frac{1}{x}$?

A. { 1, -1 } B. { 2} C. {-1} D. {1, 2, -1 }

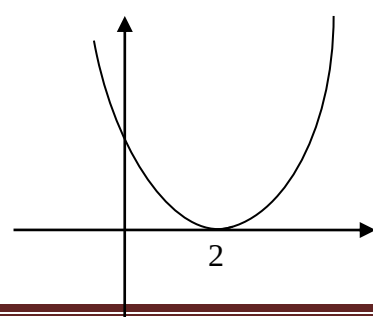
36. Which of the equations below is represented by the following parabola?

A. $y = x^2 + 2$

B. $y = (2x - 1)^2$

C. $y = 2(x-1)$

D. $y = (2x+1)^2$



37. Which of the following is a polynomial expression?

A. $x^2 - 3x + \sin x$ C. $\frac{2+\pi}{1+\pi^2}$

B. $\frac{4x^3+12x^2-x}{\pi x^2}$ D. $2 - 3x^{2/3} + 7x^{5/2} + 3x^{-1}$

38. Which of the following is Not true about the graph of $g(x) = \frac{x^3-1}{x^2-1}$?

A. The range of g is $(-\infty, 1)$ C. g is an even function

B. The line $y = 1$ is a horizontal asymptote D. As $x \to -\infty$, $g(x) \to 1$

39. Which of the following is a simplifies form of

$$\frac{t-\frac{1}{t}}{1+\frac{t}{1-t}} \div \frac{t^2-2t+1}{t},\ t \neq 1\ ?$$

A. $t + 1$ B. $t - 1$ C. $1 - t$ D. $-t - 1$

40. What are the respective values of A, B and C, so that

$$\frac{x-1}{x^3+x} = \frac{A}{x} + \frac{Bx+C}{x^2+1}\ ?$$

A. -1, 1, 1 B. -1, 1, 2 C. 1, -2, 0 D. 3, 1, 2

41. Which of the following is a polynomial of degree 3?

A. $x^3 - 3x^{-2} + x$ C. $x^2 + x^3(x - 1) + \sin(\pi/4)$

B. $x^3 + x^2(1-x) + 1$ D. $x^3 + 3x^2 + \sin(x) + 1$

42. Which of the following is true about $f(x) = x^5 (x-1)^4 (x^2 + 3)$?

A. 0 is a root of $f(x)$ with the lowest multiplicity

B. The graph of $f(x)$ crosses the x – axis at x = 1

C. The graph of $f(x)$ crosses the x-axis only at 0

D. $f(x)$ has three distinct real roots

43. Which of the following is a simplified form of $\frac{4-(a-2)^2}{a^4+2a^2+1} \div \frac{1-\frac{1}{a^2+1}}{a}$

A. $\frac{4-a}{a}$ B. $\frac{-a}{a^2+1}$ C. $\frac{-1}{a^2(a^2+1)}$ D. $\frac{4-a}{a^2+1}$

44. If $f(x) = \frac{x-1}{(x-2)^2(x+1)}$, which of the following is true about f?

A. Its graph has an oblique asymptote.
B. The graph of f does not meet its asymptote
C. As $x \to -1^+, f(x) \to -\infty$
D. As $x \to 2^-, f(x) \to -\infty$

45. If $p(x) = 3x^2$ and $q(x) = x^2 + x$, then what is the solution set of $\frac{p(x)}{3q(x)} - \frac{1}{x} = \frac{1}{q(x)}$?

A.{-1, 2} B. {2} C. { - 3, 2) D. {-3}

46. What is the solution set of the inequality $\frac{2x}{x+1} < 5$?

A.$(\frac{-5}{3}, \infty)$ B. $(-\infty, \frac{-5}{3}) \cup (-1, \infty)$ C. $(-\infty, -2) \cup (\frac{5}{2}, \infty)$ D.$\emptyset$

47. What are the values of a and b which make the mathematical statement $\frac{x+1}{x^2-9} = \frac{a}{x-3} + \frac{b}{x+3}$ *true*?

A. a=1, b=0 B. a=1/3 b=3/5 C. a= -2/5, b= 1 D. a= -2/5, b= 1/3

48. Which of the following is NOT true about $f(x) = \frac{1-2x^2}{x^2+4}$?

A. Range of f ={ y$\in \mathcal{R}$: $-2 < y \leq 0$}

B. C. y=-2 is a horizontal asymptote to the graph of f

C. The graph of f has no vertical asymptote

D. the graph of f is symmetric with respect to the the y- axis

49. What is the solution set of $1 - \frac{1}{x+2} \leq \frac{-1}{x}$?

A. (-2, 0) B. $(0, \infty)$ C. $(-\infty, -2)$ D. $(-\infty, -2) \cup (0, \infty)$

50. If p(x) = x-4, q(x) = $x^2 + 8$ and r(x)= $x^2 - 2x - 8$, then which of the following is the most simplified expression of $f(x) = \frac{x}{p(x)} - \frac{q(x)}{r(x)}$?

A. $\frac{x}{x-4} - \frac{x^2+8}{x^2-2x-8}$ C. $\frac{2}{x+2}$

B. $\frac{8x}{x-4}$ D. $\frac{2x+8}{x^2-2x-8}$

51. Which of the following is true about the rational function $f(x) = \frac{p(x)}{p(x)}$?

A. The domain of f is the set of all real numbers where q(x) is well defined and non-zero.

B. If the domain of f is R then f is polynomial.

C. The range of f is always R

D. P(x) is divisible by q(x).

52. Which of the following represents the solution set for the equation $\frac{1}{x-2} = \frac{3}{x+2} - \frac{6x}{x^2-4}$?

A. $\{-\frac{1}{2}, \frac{1}{2}\}$ B. {-4, 2} C. {-2} D. {}

53. The solution set of the in equality $\frac{x^2+5}{x^2-9} < 0$ *is equal to*:

A/ $\{x/x > 3\}$ B/ $\{x/x < -3\}$ C/ $(-3,3)$ D/ $\{x/x < -3 \; or x > 3\}$

54. Let f(x) =$\frac{5}{(x-3)^2}$ Then, which of the following is not true?

A/ f is an even function. C/ The line x=3 is vertical asymptote of the graph of f.

B/ $\{y/y > 0\}$ is the range of f. D/ The graph of f is symmetric with respect to the line x=3.

55. Suppose $\frac{x-8}{x^3+4x} = g(x) - \frac{2}{x}$ *and* $x \neq 0$. which of the following is equal to g(x)?

A.$\frac{2x-1}{x^2+4}$ B. $\frac{2x+1}{x^2+4}$ C. $\frac{x+2}{x^2+4}$ D. $\frac{x-2}{x^2+4}$

56. Which of the following is the solution set of the inequality $\frac{1}{1-\frac{1}{x}} \leq \frac{x}{x^2-1}$?

A. (-1, 1) B. $[-1,0) \cup (0,-1]$ C. $(-1,0) \cup (0,1)$ D. $(-\infty,-1) \cup (1,\infty)$

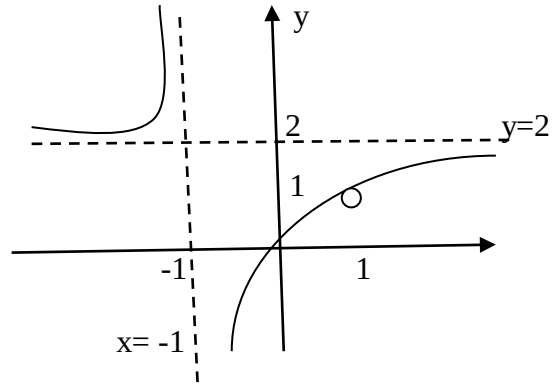
57. Which of the following function could most likely be sketched as in the figure below?

A. $f(x) = \frac{2x}{x+1}$

B. $f(x) = \frac{2x(x-1)}{x^2-1}$

C. $f(x) = \frac{2}{x+1}$

D. $f(x) = \frac{2x^2}{x^2-1}$



58. Which of the following is a rational function?

A. $f(x) = \frac{\sqrt{2}x^3 - x + log2}{x^4 + x^2 + \pi}$

B. $g(x) = 3x^4 - \sqrt{x^2+1} + 2x$

C. $h(x) = \frac{x^2 - 2^x + x}{x^4 + x} + 1$

D. $r(x) = \frac{x^2 - sinx + 2}{1+x}$

59. Simplifying $\left(3^x - \frac{1}{3^x}\right)^2 - \left(3^x + \frac{1}{3^x}\right)^2$, gives;

A/ 1 B/ 0 C/ -4 D/ -1

60. What is the solution set of $\frac{1-\frac{1}{x}}{1-\frac{1}{x^2}} = 3x^2 - \frac{x}{1+\frac{1}{x}}$?(2008)

A. $\left\{-1, \frac{1}{3}\right\}$ B. $\left\{\frac{1}{3}\right\}$ C. $\left\{3, \frac{-1}{3}\right\}$ D. $\left\{-\frac{1}{3}\right\}$

61. Suppose $f(x) = \frac{Q(x)}{x(x^2-1)}$ where Q(x)= is a quadratic function. Which of the following is necessarily true about the graph of f? (2008)

A. $x = 0, x = 1$ *and* $x = -1$ are the vertical asymptotes of the graph of f

B. *The* graph of f does not intersect with its horizontal asymptote.

C. The vertical asymptotes of the graph of f is only x=-1 if $Q(x) = x^2 - x$.

D. The vertical asymptotes of the graph of f is only x=1 $Q(x) = 2x^2$.

62. Which one of the following is true about the horizontal asymptote(s) of the graph $y = \frac{|x|+2}{x}$?(2008)

A. Y=2 is the only horizontal asymptote of the graph.

B. Y=1 and y=-1 are the horizontal asymptotes of the graph.

C. Y=2 and y=-2 are the horizontal asymptotes of the graph.

D. Y= 1 is the only horizontal asymptote of the graph.

63. The solution set of the equation $\frac{x^3}{x+3} + \frac{3x}{x^2+5x+6} = \frac{2x}{x+3}$ *is*? (2008)

A. {0, 1} B. {-1, 1} C. {-1, 0, 1} D. {-1, 0}

64. What is the simplified form of $\frac{a^{-1}\,b^{-1}}{a^{-3}-b^{-3}}$?

A. $\frac{a^2b^2}{b^2-a^2}$ B. $\frac{a^2b^2}{b^3-a^3}$ C. $\frac{a^3-b^3}{ab}$ D. $\frac{a^3-b^3}{a-b}$

65. Which one of the following is true about the graph of $f(x) = \frac{x^2+5x+6}{x^2-4}$ +3?

A. The graph has a hole x = 2.

B. The vertical asymptotes of the graph are $x = -2 \; and \; x = 2$

C. A horizontal asymptote of the graph is $y = 4$.

D. The graph has $y - intercept \; at \; \left(0, -\frac{3}{2}\right)$

66.

CHAPTER 3

67. For what value of b does the parabola $p(x) = ax^2 + x + b$ pass through the points (-1, 5) and (2, -1)?

A. 9 B. 3 C. -3 D. -15

68. A parabola with focus at (3,-1) has directrix y = 3. Which one of the following is the equation of the parabola?

A. $(x-3)^2 = -4(y+1)$ C. $(x-3)^2 = 4(y+1)$

B. $(x-3)^2 = -8(y-1)$ D $(x-3)^2 = 8(y-1)$

69. A satellite moves along a hyperbolic curve whose horizontal transverse axis is 24 km and an asymptote $y = \frac{5}{12}x + 2$. Then what is the eccentricity of the hyperbola?

A. $\frac{5}{13}$ B. $\frac{12}{13}$ C. $\frac{13}{12}$ D. $\frac{15}{3}$

70. If a line with angle of inclination of $\frac{3}{4}\pi$ passes through (0,1), which one of the following is the equation of the line?

A. $y = -x + 1$ B. $y = x + 1$ C. $y = -x - 1$ D. $y = x - 1$

71. If $x^2 - 6x + y^2 + k = 0$ is equation of a circle with radius 2, then what is the value of k ?

A. 13 B. 5 C. 4 D. -4

72. Let the equation $x^2 + 2x + y^2 = 8$ represents a circle. Then which one of the following lines cut the circle at exactly two points?

A. $4x + 3y + 19 = 0$ B. $3x + 4y + 14 = 0$ C. $2y = 5x + 43$ D. $2x = y - 50$

73. If the equation $(x-2)^2 - (y-2)^2 = 1$ represent a hyperbola, which one of the following represents equation of an asymptote to the hyperbola?

A. $y = 4 - x$ B. $x + y = 1$ C. $x = 2 - y$ D. $x + 2y = 3$

74. If two lines $y = x$ and $y = x - 4$ are tangent to a circle at (2 , 2) and (4 ,0), respectively , then what is the equation of the circle?

A. $(x-2)^2 + y^2 = 4$ C. $(x-3)^2 + (y-1)^2 = 2$

B. $(x-4)^2 + (y-2)^2 = 4$ D. $(x-1)^2 + (y+1)^2 = 10$

75. What is the equation of the directrix for the parabola whose equation is $y^2 - 8x + 6y + 25 = 0$?

A. $y = 3$ B. $x = 2$ C. $x = 0$ D. $x = 4$

76. The equation $3x^2 - 6x = y^2$ represents:

A. an ellipse with center at (1, 0)

B. a hyperbola with center at (1, 0)

C. an ellipse with center at (-1, 0)

D. a hyperbola with one of its foci at (1,0)

77. A mirror has elliptic edge. If the shortest and longest distances between any two points on the edge of the mirror through the geometric center of the mirror are respectively 6cm and 10cm, which of the following is a possible equation of the edge of the mirror?

A. $\frac{x^2}{9} + \frac{(y-1)^2}{5} = 1$ C. $\frac{(x+1)^2}{36} + \frac{y^2}{100} = 1$

B. $\frac{(x-1)^2}{35} + \frac{y^2}{9} = 1$ D. $\frac{(x+1)^2}{36} + \frac{(y-1)^2}{25}$

78. Consider a circle whose center is on the x-axis, If a line given by $y = x$ is tangent to the circle at point (2, 2), what is the equation of the circle?

A. $x^2 + y^2 = 8$ C. $(x - 4)^2 + y^2 = 8$

B. $(x-2)^2 + y^2 = 4$ D. $(x-1)^2 + y^2 = 5$

79. What is the vertex and the equation of the directrix, respectively of the parabola

$x + y^2 + 2y + 1 = 0$?

A. $(0,-1), x = \frac{-1}{4}$ B. $(-1,0), y = \frac{-1}{4}$ C. $(0,-1), x = \frac{1}{4}$ D. $(-1,0), y = \frac{1}{4}$

80. The orbit of Mercury around the sun forms an ellipse with eccentricity 0.206, length of the major axis 1.16×10^8km and the sun at one focus. Which of the following is the best approximation of the maximum distance from Mercury to the sun?

A. 7.596×10^7Km B. 5.695×10^7Km C. 8.695×10^7Km D. 6.995×10^7Km

81. Two perpendicular lines ℓ_1 and ℓ_2 are intersecting at (-1, 2). If the angle of inclination of ℓ_1 is 45^0, then what is the equation of ℓ_2?

A. $y = -x + 3$ B. $y = x + 3$ C. $y = -x + 1$ D. $y = x + 1$

82. The equation of an ellipse with center at (1, 4), vertices at (10, 4), and (1,2) is:

A. $4(x - 1)^2 + 81(y - 4)^2 = 324$ C. $9(x - 1)^2 + 4(y - 4)^2 = 1$

B. $(x - 1)^2 + 9(y - 4)^2 = 4$ D. $2(x - 1)^2 + 9(y - 4)^2 = 4$

83. The value(s) of x where the graph of the function $y = \frac{x^2-1}{x^2}$ crosses its horizontal asymptote is (are):

A. $x = -2$ B. $x = -1$ and $x = 1$ C. $x = 0$ D. $x = -\sqrt{2}$ and $x = 1 + \sqrt{2}$

84. What is the focus of the parabola $y^2 + 4y + 8x = 4$?

A. (1, -2) B. (-1, -2) C. (3, -2) D. (-3, -2)

85. Which one of the following is true about a conic section represented by the equation

$\frac{x^2}{k} + \frac{y^2}{k-9} = 1$?

A. It is a circle whose center is at origin for some $k \in \Re$

B. It is an ellipse whose major axis is vertical when $k > 9$.

C. It is a hyperbola whose foci are at $(-3k, 0)$ and $(3, 0)$ when $0 < k < 9$.

D. It is a hyperbola whose foci are at $(-3k, 0)$ and $(3k, 0)$ when $0 < k < 9$.

86. Which one of the following is the center of an ellipse

$9x^2 + 4y^2 - 36x + 8y + 4 = 0$?

A. (2,1) B. (2,-1) C. (4,9) D. (-1,2)

87. What is the distance from the origin to the line that passes through (1,0)and (0,1)?

A. $\frac{1}{2}\sqrt{2}$ B.1 C. $\frac{1}{2}$ D. $\sqrt{2}$

88. Line l passes through (0,5) and (-5,0). What is the angle between the y-axis and l in radian measure?

A. $\frac{\pi}{2}$ B. $\frac{\pi}{4}$ C. $\frac{\pi}{3}$ D. $\frac{3\pi}{4}$

89. What is the distance between the two foci of the hyperbola whose equation is given by

$$4(y-1)^2 - 16(x+3)^2 = 1?$$

A. $3\sqrt{2}$ B. $\frac{1}{2}\sqrt{5}$ C. $\frac{1}{4}$ .D. $\frac{1}{\sqrt{10}}$

90. Which of the following is the equation of the line through (a, b) and perpendicular to the line passing through (a,2b) and (b, 2a) for a≠ b

A.2y-x = 2b+ a C. 2y-x =2b - a

B. y- 2x = b- 2a D. y – 2x = b+ 2a

91. Let L_1: 3y-9 = 4x and L_2:2y-3x +2 = 0 represent two intersecting lines in a plane. If $\propto$ is the angle of intersection between L_1 and L_2, then what is $tan \propto$?

A. 3/2 B. 4/3 C. 1/6 D. 1/18

92. The floor of a conference hall is made in a shape of ellipse. If the largest chord has length 20 meters and the smallest is 16 meters, what is the length between the foci?

A. 24m B. 12m C. $9\sqrt{2}$ m D. 6m

93. Which of the following is an asymptote of the hyperbola $4x^2 - y^2 + 2y = 5$?

A. y = -2x+1 C. $y = -\frac{1}{2}x + 1$

B. y = 2x-1 D. $y = -\frac{1}{2}x - 1$

94. For what value(s) of k is the equation: $x^2 + y^2 + 6x - 4x + k = 0$ represent a circle?

A. For all $k \geq 0$ C. For all $k < 13$

B. For all $k \geq 10$ D. for k =16

95. The equation of the circle with end points of a diameter at (-2,0) and (4,2) is:

A. $(x-1)^2 + (y-1)^2 = 10$ C. $(x+1)^2 + (y+1)^2 = 10$

B. $(x+1)^2 + (y+1)^2 = 10\sqrt{2}$ D. $(x-1)^2 + (y-1)^2 = \sqrt{10}$

96. Let (a, b) and (b, a) be points such that $a \neq b$. Which of the following is the equation of the line through (a, b) and perpendicular to the line containing the given points?

A. y= x + b- a C. y = -x+ b + a

B. y= x-a-b D. y= -x + b + a

97. The equation of the circle tangent to the x-axis at (6,0) whose center is on the line y= $\frac{1}{2}x$ is

A. $(x-6)^2 + y^2 = 9$ C. $(x-6)^2 + y^2 = 36$

B. $(x-6)^2 + (y-3)^2 = 36$ D. $(x-6)^2 + (y-3)^2 = 9$

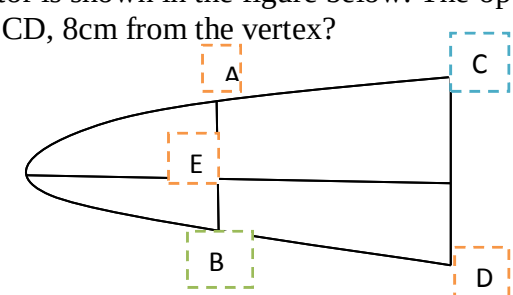
98. A cross-section of a parabolic reflector is shown in the figure below. The opening at the focus AB, is 12cm. what is the diameter of the opening, CD, 8cm from the vertex?

A. $8\sqrt{6}$ cm

B. 12cm

C. 9cm

D. $6\sqrt{8}$ cm



99. Given three points A(1,0), B(-3, 0) and C(1,2), the equation of the line through A and perpendicular to BC is

A. 2x+y = 2 C. y = -2x

B. y = -2x +1 D. x - 2y = 1

100. Let *l* be the line containing (1, 5) and its angle of inclination be $\theta = 135^0$. which of the following is the distance from *l* to (-1, 1)?

A. $2\sqrt{2}$ B. $3\sqrt{2}$ C. $4\sqrt{2}$ D. $6\sqrt{2}$

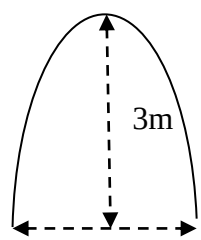
101. Which of the following is the equation of the circle with center at (2,-1) and tangent to the y-axis?

A. $(x+2)^2 + (y-1)^2 = 1$ C. $(x-2)^2 + (y+1)^2 = 4$

B. $(x-2)^2 + (y+1)^2 = 9$ D. $(x+2)^2 + (y-1)^2 = 4$

102. Consider a gate whose shape is a parabolic arch of height 3m and base width 3m as shown in the figure below. If the origin of the coordinate system is at the vertex, the equation that represets the edge of the gate is:

A. $3x^2 + 3y = 0$
B. $4x^2 + 3y = 0$
C. $y = -3x^2 + 1$
D. $3y^2 - 4x = 0$



103. What is the length of the minor axis of $x^2+9y^2 - 2x = 0$?

A. $\frac{1}{9}$ B. $\frac{2}{3}$ C. 2 D. 6

104. The equation $x^2-4y^2 = -1$ represents

A. A hyperbola with one of its foci at the origin
B. A hyperbola with vertex at the origin
C. A hyperbola with vertices at $(\frac{-1}{2}, 0)$ and $(\frac{1}{2}, 0)$
D. A hyperbola with foci at $(0, \frac{-\sqrt{5}}{2})$ and $(0, \frac{\sqrt{5}}{2})$

105. What is the focus of the parabola whose equation is $y^2 + 8x + 6y + 25 = 0$?

A. (-2, 3) B. (3, 2) C. (-4, -3) D.(0, -2)

106. If a line passes through the point (2, 1) and its angle of inclination is 45^0, then which one of the following represents the equation of the line?

A. x= y+1 C. y =2x +1

B. $\sqrt{2}y = 2x + 3$ D. 2y + x = 2

107. Which of the following is NOT an equation of a hyperbola?

A. $x^2-y^2 + 4x - 6y = 0$ C. $x^2-y^2 = -8$

B. $y^2-x^2 + 2x - 4y = -3$ D. $y = -\frac{4}{x}$

108. Given the curve y= $ax^2 + c, a \neq 0$, which of the following is necessarily true?

A/ The curve has no x- intercept if ac<0. C/ The curve is above the x- axis if ac>0.

B/ The curve has two x- intercept if ac>0. D/ The curve has one x-intercept if ac=0.

109. Given the parabola y = x^2 and the circle $\frac{1}{2}x^2 + \frac{1}{2}y^2 = 1$ which of the following is true?

A. The two curves meet in exactly one point. C. The two curves do not meet.

B. The two curves meet in exactly two points. D. The two curves meet in exactly three points.

110. The possible value(s) of c for which the line x+2y=c is tangent to the circle $(x-1)^2 + (y-2)^2 = 5$ is (are):

A/ -1 and 9 B/ 0 and 10 C/ 1 and 2 D/ -1 and 3

111. Which of the following pairs of lines are perpendicular to each other?

A. L_1:3x-4y-8=0 and L_2:4x-3y+8=0 C. L_1: 2x+5y+10=0 and L_2:2x-5y-10=0

B. L_1: 6x+8y-16=0 and L_2: 8x-6y-18=0 D. L_1: y=2x+5 and L_2:y-2x-6=0

112. The value of m for which the two lines 3x-my+1=0 and 6x-4y=0 have no common point is

A/ 0 B/ 2 C/ 3 D/-1

113. The shortest and the longest distances from (7,8) to the circle x^2+y^2-4x-2y=13 are respectively:

A/ $3\sqrt{2}\ and\ 9\sqrt{2}$ B/ $6\sqrt{2} and\ 9\sqrt{2}$ C/ $3\sqrt{2} and\ 6\sqrt{2}$ D/ $9\sqrt{2} and 12\sqrt{2}$

114. Which of the following is not true about the parabola $y^2 = 8px, for\ p \neq 0$?

A/ The focus is at (2p, 0) C/ Its axis of symmetry is the y-axis.

B/ The directrix has equation x=-2p. D/ The length of the latus rectum is /8p/

115. Which one of the following is equation of a circle whose center is on y-axis and radius is 3?(2008)

A. $x^2 + y^2 + 6y = 0$ **C.** $x^2 + (y-2)^2 = 3$

B. $(x-2)^2 + y^2 = 9$ **D.** $x^2 - 2x + y^2 = 8$

116. The planet mercury's orbit around the sun is an ellipse with eccentricity 0.206, length of the major axis 1.16x10^8 km and the sun at one focus. What is the maximum distance from mercury to the sun? (2008)

A. 6.99x10^8 km B. 6.99x10^7 km C. 9.66x10^7 km D. 9.66x10^8 km

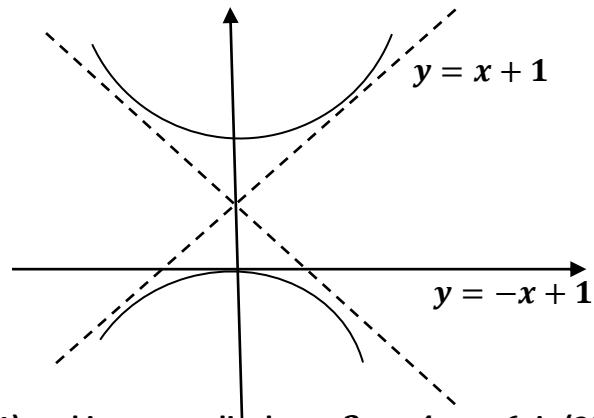
117. The graph of a hyperbola and the lines of its asymptotes are as shown in the figure. Which one of the following is an equation of the hyperbola? (2008)

A. $y^2 - 2y - x^2 = 0$

B. $x^2 - (y-1)^2 = 1$

C. $y^2 - 3y - x^2 = 0$

D. $(x-1)^2 - y^2 = 1$



118. The equation of the line that passes through (2, -1) and is perpendicular to $3x + 4y = 6$ is (2008)

A. $-4x + 3y = 5$ **C.** $4x + 3y = 11$

B. $4x - 3y = 5$ **D.** $-4x + 3y = -11$

119. The equation of the conic section $4x^2 + 9y^2 = 36$ represents: **(2008)**

A. Circle B. hyperbola C. parabola D. ellipse

120. What is the focus of the parabola $y^2 + 6y + 8x = 7$? **(2008)**

A. (4, 3) B. (0, 3) C. (4, -3) D. (0, -3)

121. What is the equation of a line that passes through point(a,a) in the xy-plane if it is parallel to a line that passes through points (a, b) and (b, a) where $a \neq b$? (2009)

A. $y = x$ B. $y = -x$ C. $y = -x + 2a$ D. $y = 2x - a$

122. What are the value for the center(C) and radius(r) of the circle $x^2 + y^2 - 4x + 6y = 5$?(2009)

A. $C = (-2, 3), r = 3\sqrt{2}$ C. $C = (2, -3), r = 2\sqrt{3}$

B. $C = (2, -3), r = 3\sqrt{2}$ D. $C = (-2, 3), r = 2\sqrt{3}$

123. What is the radius of the largest possible circle that can be inscribed in the ellipse given by(2009)

$5(x-1)^2 + 3y^2 = 15$?

A. $\sqrt{3}$ B. $\sqrt{5}$ C. 3 D. 5

124. Suppose the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is a reciprocal to that of the eccentricity of the ellipse $x^2 + 4y^2 = 4$. if the hyperbola passes through a focus of the ellipse, then what is the equation of the hyperbola? (2009)

A. $x^2 - 2y^2 = 2$ C. $\frac{x^2}{3} - \frac{y^2}{2} = 1$

B. $x^2 - 3y^2 = 3$ D. $\frac{x^2}{2} - \frac{y^2}{3} = 1$

125. The earth`s orbit has a semi-major axis $a \approx 149.6\ GM$ (gigameters) and an eccentricity of ≈ 0.017 . What is the approximate value of the semi-minor axis?

A. 152.14 Gm B. 145.32 Gm C. 149.06 Gm D. 149.58 Gm

126. If the circle passing through the point $(-1,0)$ touches the $y-$ axis at (0,2),then what is the equation of the circle?

A. $x^2 + y^2 + 5x + 4y + 4 = 0$ C. $x^2 + y^2 - 5x - 4y + 4 = 0$

B. $x^2 + y^2 - 5x + 4 + 4 = 0$ D. $x^2 + y^2 + 5 - 4y + 4 = 0$

127. The center of a circle on the line $y = 2x$ and the line $x = 1$ is tangent to the circle at (1,6). How long is the radius of the circle?

A. 5 $B.4$ $C.3$ $D.2$

128. Which one of the following is true about the pair of lines :$3x + 9y - 24 = 0\ and\ 4x + 12y + 32 = 0$?

A. Perpendicular lines c. parallel and distinct lines

B. Intersecting lines D. representing the same lines

129.

CHAPTER 4

130. Let p, q and r be propositions such that $p \Rightarrow (r \vee \neg q)$ is false. Then, which one of the following proposition is true?

A. $p \Rightarrow r$ B. $\neg r \Rightarrow q$ C. $\neg p \Leftrightarrow q$ D. $q \Leftrightarrow r$

131. Which one of the following is equivalent to $[\neg[(\forall x)(p(x) \Longrightarrow Q(x)]]$?

A. $(\forall x \neg p(x) \Longrightarrow \neg Q(x))$ C. $(\exists x)(\neg p(x) \wedge Q(x))$

B. $(\exists x)(\neg p(x) \Longrightarrow \neg Q(x))$ D. $(\exists x)(p(x) \wedge \neg Q(x))$

132. If $(p \vee q) \Rightarrow (\neg r \wedge r)$ is true, then which one of the following is necessarily true?

A.$(p \vee r) \Rightarrow$q B. $\neg q \wedge r$ C. $p \neg \Leftrightarrow r$ D. $\neg p \vee r$

133. Let p, q and r be propositions such that $p \Longrightarrow (r \; v \; ך q)$ is false. Then, which one of the following proposition is true?

$A. p \Longrightarrow r$ B. $ך r \Longrightarrow q$ C. $ך p \Leftrightarrow q$ D. $p \Leftrightarrow r$

134. Suppose proposition $p \Rightarrow -q$ is false (F), which of the following is true?

A. $\rightharpoonup q \wedge (p \Longrightarrow q)$ B. $\rightharpoonup p \wedge (q \Leftrightarrow \rightharpoonup p)$ C. $(\rightharpoonup q \vee p) \Leftrightarrow q$ D. $(p \wedge q \Leftrightarrow \rightharpoonup p$

135. Suppose $e(x) = x$ is even; $p(x) \equiv$ x is prime; $d(x) \equiv x$ is divisible by 2 which one of the following has the truth value F one the set of natural numbers?

A. $(\exists\, x)[e(x) \wedge p(x)]$ C. $(\exists\, x)[e(x) \wedge \neg d(x)]$

B. $(\forall x)[e(x) \Rightarrow d(x)]$ D. $(\forall x)[e(x) \vee \rightharpoonup d(x)]$

136. Consider the following argument form. Production is high if rain continues. Rain does not continue. Therefore, either production is low or rain continues.

Let p: production is low

Q: rain continues

The following table is also given about p and q

Rows	P	q	$\rightharpoonup p$	$\rightharpoonup q$	$\rightharpoonup p \Rightarrow q$	q$\Rightarrow \rightharpoonup p$	p$\vee q$
1	T	T	F	F	T	F	T
2	T	F	F	T	T	T	T
3	F	T	T	F	T	T	T
4	F	F	T	T	F	T	F

Which of the following is necessarily true?

A. The argument form is valid due to row 2

B. The argument form is valid due to rows 2 and 3

C. The argument form is invalid due to row 4

D. The argument form is invalid due to rows 1 and 3

137. For arbitrary propositions *p* and *q*, which one of the following is a valid equivalence?

A. $\neg(p \Longrightarrow q) \equiv (q \Longrightarrow P)$ C. $[pv \neg q] \equiv [p \Longrightarrow q]$

B. $[\neg(p \Longrightarrow q) \wedge p] \equiv (p \wedge \neg q)$ D. $[(p \vee q) \Longrightarrow q] \equiv [\, p \Longrightarrow \neg q]$

138. Suppose that p represents the statement " *He missed the tournament*", q represents the statement " *He got the gold medal* ", And r represents the statement " *He look a trip abroad. "* Then which of the following symbolic expression represents the statement: " If he takes a triple aboard and he does not miss the tournament, then he will get the gold medal."?

A. $(r \Longrightarrow q) \wedge \neg p$ C. $(r \wedge \neg p) \Longrightarrow q$

B. $r \wedge (p \Longrightarrow q)$ D. $\neg (r \vee p) \vee q$

139. Which one of the following is NOT a tautology?

A. $[p \vee (q \Longrightarrow r)] \Leftrightarrow [\neg p \Longrightarrow (q \Longrightarrow r)]$

B. $p \vee (q \Longrightarrow \neg p)$

C. $p \Longrightarrow (p \Longrightarrow q) \vee q$

D. $[p \Leftrightarrow (q \wedge \neg r)] \Leftrightarrow [\neg p \Leftrightarrow (\neg q \vee r)]$

140. If each of the compound propositions P $\vee$ Q, P $\Longrightarrow$R and $\neg$R is True, then which one of the following is True?

A. P B. Q C. Q $\Longrightarrow$P D. P $\wedge \neg$R

141. Which one of the following arguments is valid?

A/ $p, p \Rightarrow q, q \Rightarrow r \vdash r$ C/ $q,\ p \Rightarrow\ q \vdash\ p$

B/ $p \wedge < ך q, r \vee\ p \vdash r \Rightarrow q$ D/ $p \Rightarrow\ q, r \Rightarrow q, r \vdash p$

142. *Which* one of the following is valid logical arguments?

A. $p \Rightarrow q, q \vdash p$ *C.* $\neg p \wedge q, q \Rightarrow r \vdash r$

B. $p \Leftrightarrow q, p \Rightarrow q \vdash q$ *D.* $\neg p, p \vee q, r \Rightarrow q \vdash r$

143. If x and y are non negative integers, which of the following is NOT true?

A. $(\forall x \exists y)(y > x^2 - 1)$ C. $(\exists y \forall x)(y \leq x^2 - 1)$

C. $(\exists x \forall y)(y > x^2 - 1)$ D. $(\exists y \exists x)(y \leq x^2 - 1)$

144. For real numbers x and y, which one of the following statements is true?

A. $(\forall x \exists y)(y + x^2 + 1 = 0)$ C. $(\exists y \forall x)(y + x^2 + 1 = 0)$

B. $(\exists x \forall y)(y + x^2 + 1 = 0)$ D. $(\forall y \exists x)(y + x^2 + 1 = 0)$

145. Consider the following argument: "If he does not love her, she will not marry him. He love her .therefore, she will marry him". If 'p ≡ *He loves her'* and 'q ≡ *she will marry him '*, which one of the following is the correct representation of the argument and its validity?

A. $\neg p \Rightarrow \neg q, p \vdash q; valid\ argument$ C. $p \Rightarrow q, p \vdash q; valid\ argument$

B. $\neg p \Rightarrow \neg q, p \vdash q; invalid\ argument$ *D.* $p \Rightarrow q, p \vdash q; invalid\ argument$

146. suppose that l represents *"I eat lemons"* and *h* represents *" The lemons are dipped in honey".* Then which of the following symbols represent the statement *"I eat lemons if they are dipped in honey"?*

A. $l \Longrightarrow h$ *B.* $\rightharpoondown l \vee h$ *C.* $l \Leftrightarrow h$ *D.* $h \Longrightarrow l$

147. Let P(x): x is positive and Q(x): x > 5

Which of the following is the negation of $(\forall x)(Q(x) \Longrightarrow P(x)$?

A. There is x such that $x \leq 5$ *and x is positive*

B. There is x such that $x > 5$ *and x is not positive*

C. There is x such that $x \leq 5$ *and x is not positive*

D. There is x such that $x > 5$ *and x is positive*

148. Let P(x): $x^2 + x$ is positive. *Which* one of the following is equivalent to $\neg(\exists x)P(x)$

A. $(\exists x)\neg(x^2 + x > 0)$ C. $(\forall x)(x^2 + x < 0)$

B. $(\exists x)(x^2 + x \leq 0)$ D. $(\forall x)(x^2 + x \leq 0)$

149. If $(P \wedge Q) \Rightarrow (\neg S \vee R)$ is FALSE, *Which* one of the following is true?

A. $S \Rightarrow R$ C. $P \wedge R$

B. $\neg S \vee \neg P$ D. $(P \wedge \neg Q) \Leftrightarrow R$

150. If the truth value of a proposition p is False, then which one of the following compound propostion has a truth value True?(2008E.C)

A. $\neg p \wedge p$ **B.** $-p \Longrightarrow p$ **C.** $\neg(\neg p \vee p)$ **D.** $p \Longrightarrow \neg p$

151. What is the contra positive of " f $x \in \mathbb{N}$, then x is integer and x>0."? (2008E.C)

A. if x is not integer or x<0, then x$\notin \mathbb{N}$.

B. if x is an integer and x>0, then $x \in \mathbb{N}$.

C. if x is not integer or x≤0, then x$\notin \mathbb{N}$.

D. if x$\notin \mathbb{N}$, *then* x is not integer and x≤0.

152. Which one of the following compound propositions is a tautology? (2008E.C)

A. $(q \vee \neg q) \Longrightarrow p$ **C.** $p \vee (q \wedge \neg q)$

B. $p \Longrightarrow (q \vee \neg q)$ **D.** $p \Longrightarrow (q \wedge \neg q)$

153. Consider the following argument:

" If there is no rain, then there is starvation.

There is rain.

Therefore, there is no starvation."

Letting $r \equiv 'there\ is\ rain'$ *and* $s \equiv 'there\ is\ starvation'$. Which one of the following is the correct symbolic form of the argument and its validity?

A. $\neg r \Longrightarrow s, r \vdash \neg s, valid\ argument$
B. $\neg r \Longrightarrow s, r \vdash \neg s,\ invalid\ argument$
C. $\neg r \Leftrightarrow s, r \vdash \neg s, valid\ argument$
D. $\neg r \Leftrightarrow s, r \vdash \neg s,\ invalid\ argument$

154. $If\ \neg p \Rightarrow r\ False\ and\ p \Leftrightarrow q\ is\ true\ then\ which\ of\ the\ following\ is\ True?$

A. $p \vee (\neg q \wedge r)$ C. $\neg p \Longrightarrow (q \vee r)$

B. $\neg p \wedge (q \Longrightarrow r)$ D. $p \Leftrightarrow (\neg q \vee r)$

155. For real number x and y, which one of the following is **NOT** true?

A. $(\forall x)(\forall y)(y^2 + x^2 \geq -1)$ C. $(\exists x)(\forall y)(y \geq x^2+1)$

B. $\boldsymbol{(\forall x)(\exists y)(y \geq x^2+1)}$ **D.** $(\exists x)(\exists y)(y \geq x^2+1)$

156.

157. Which one of the following is a valid argument?

A. If I don`t change my oil regularly, my engine will die. My engine died, Thus, didn't change my oil regularly.

B. If I am literate, then I can read and write. I can read but I can`t write. Thus I am not literate.

C. If you do every problem in the book, then you will learn the subject. You learned the subject. Thus, you did every problem in the book.

D. If it rains or snows, then my roof leaks. My roof is leaking. Thus, it is raining and snowing.

158.

CHAPTER 5

159. A box contains 5 white, 6 red and 4 black balls of identical size. If 3 balls are randomly taken out of the box one after the other, what is the probability that the first ball is white and both the second and third balls are red?

A. $\frac{2}{15}$ B. $\frac{3}{15}$ C. $\frac{4}{75}$ D. $\frac{5}{91}$

160. A committee consisting of 3 students is to be selected from 10 candidates among which 4 are girls. What is the probability that at least one girl is selected?

A. $\frac{5}{6}$ B. $\frac{2}{3}$ C. $\frac{1}{3}$ D. $\frac{1}{6}$

161. A group of six students take their seats at random in a round table for a discussion. What is the probability that two specific students do NOT sit together?

A. $\frac{3}{5}$ B. $\frac{2}{3}$ C. $\frac{2}{5}$ D. $\frac{1}{3}$

162. The mark that students scored in an examination is grouped in class intervals as shown in the following table.

Class interval (Mark)	Number of students
55-64	8
65-74	12
75-84	20
85-94	6
95-100	4

What is the median of the mark?

A. 25.0 B. 75.5 C. 77.0 D. 79.5

163. How many four digit even numbers can be formed from 1, 2, 3,4 and 5 if the numbers star with3?

A. 40 B. 50 C. 100 D. 120

164. Among students who took a quiz, 15 students scored 6, 20 students scored 7, 10 students scored 8 and 5 students scored 10, what is the average scored of the student?

A. 7.8 B. 7.5 C. 7.2 D. 7.0

165. If S is a set with 10 elements and $A \subseteq S$, what is the probability that A has 3 or more elements?

A. $\frac{7}{10}$ B. $\frac{8}{11}$ C. $\frac{121}{128}$ D. $\frac{7}{128}$

166. A company produced 25,000 bulbs and randomly tested 2% of the product. Among the tested bulbs, if 40 have defect of type D_1, 60 have defect of type D_2 and 25 have both types of defects, what is the probability that a bulb produced by the company has none of the defect?

A. 0.95 B. 0.80 C. 0.85 C. 0.20

167. If Q_i , Di and P_i are respectively the ith – quartile, i^{th}decile and i^{th} percentile one of the following is necessarily true?

A. $Q_{2=\frac{Q_1+Q_3}{2}}$ B. $D_3 > P_{25}$ C. $P_{25} > Q_1$ D. Q_2 = mean the following

168. If distinct codes (words) of eight letters are formed by rearranging the letters in the word 'ABBEBAYE', how many of the codes being B or Y?

A. 840 B. 630 C. 1680 D. 420

169. If the list of a measurement is 10, $\propto$, 5, $\propto$, 5, 10, 20, 15, 20, 5 with mean $\bar{x}$, then what is the value of $\propto$ in terms of $\bar{x}$?

A.$10\bar{x}$ - 90 B. $9\bar{x}$ - 90 C. $5\bar{x}$ - 90 D. $5\bar{x}$ – 45

170. The following is the frequency distribution of a grouped data.

Class Interval	Frequency (f)
3-7	2
8-12	2
13-17	10
18-22	6

What is the mean and standard deviation of the distribution, respectively?

A. 15, $2\sqrt{5}$ B. 15, $\sqrt{5}$ C. 12.5, $5\sqrt{2}$ D. 12.5, $\sqrt{15}$

171. You are given a data on the age of students, in a primary school

Age	8	10	11	12	13
Number of students	5	15	8	10	2

Which of the following is **NOT** true about the data?

A. The median is 10.5 C. The mean is 10.5

B. The mode is 10 D. The range is 5

172. The following is a table of simple frequency distribution of a data with variable.

x	1	3	4	5	7
Frequency	2	5	6	5	2

The standard deviation of the data is equal to:

A. $\sqrt{3}$ B. 3 C. $\sqrt{2.3}$ D. $\sqrt{3.6}$

173. A school has three classrooms for grade 11 namely, 11A, 11B, and 11C, The number of students in these classrooms is 28, 20 and 22, respectively. All the students took an examination and the average score of the students of 11A, 11B, and 11C is 60, 70 and 70, respectively. What is the average score in this examination for all grade 11 students?

A. 66 B. 66.67 C. 65 D. 65.67

174. The following is set of data representing the average mark of 13 students: 91, 89, 93, 91, 87, 94, 92, 85, 91, 90, 96, 93, 89. Then which one of the following statements is true about the data?

A. The median is 90.5 C. The range of the marks is 11

B. The upper quartile is 92 D. The mean is 91.5

175. Different codes, each of which consisting of five characters, are to be generated in such a way that the first two characters are any of the English capital letters (A to Z) and the remaining three are any of the digits (0,1,...,9). How many distinct codes can be generates so?

A. 468,000 B. 260 C. 676,000 D. 26! x 10!

176. Three persons p1, p2 and p3 are firing at a target independently and have a probability 0.7, 0.5 and 0.4, respectively, of hitting the target. What is the probability that at least one of them hits the target?

A. 0.95 B. 0.85 C. 0.91 D. 0.99

177. Suppose that the first 3 letters(A, B, and C) and number digits are to be used to form car plates in a small town. How many different plates can be formed in total that contain 1,2 or 3 letters and then followed 3 digits?

A. 3,000 B. 27, 000 C. 39, 000 D. 100,000

178. A city has two daily newspapers, X and Y. The following information was obtained from a survey of 100 residents of the city: 35 people subscribe to X, 60 people subscribe to Y and 20 subscribe to both newspapers. Then how many of the people in the survey do not subscribe to either of the newspapers?

A. 5 B. 25 C. 40 D. 55

179. A measurement is grouped into five class intervals with the following frequency distribution.

Class interval	5-15	15-25	25-35	35-45	45-55
Frequency	22	40	68	50	20

What are the first quartile Q_1 and the 75th percentile P_{75} of the measurement?

A. $Q_1 = 20$, $P_{75} = 40$, C. $Q_1 = 20$, $P_{75} = 39$

B. $Q_1 = 22$, $P_{75} = 40$, D. $Q_1 = 22$, $P_{75} = 39$

180. The following is a simple frequence distribution of a data with variable X.

X	**3**	**5**	**6**	**7**
Frequency	**2**	**5**	**5**	**1**

What are the mean ($\bar{x}$) and variance δ^2 of the data?(2008E.C)

A. $\bar{x} = 5$, $\delta^2 = 0.7$ **C. $\bar{x} = 6$, $\delta^2 = 0.7$**

B. $\bar{x} = 6$, $\delta^2 = 1.4$ **D. $\bar{x} = 5$, $\delta^2 = 1.4$**

181. A box contains 10 items of which 3 are defective. If 2 items are randomly taken out of the box, what is the probability that both items are not defective? (2008E.C)

A. 7/10 B. 4/7 C. 7/15 D. 49/100

182. Items produced by a certain company are subjected to two kinds of defects D_1 and D_2. Out of a total product, 5% have defect D_1, 10% have the defect D_2, and 2% have both defects. What is the probability that a randomly selected item has neither defect D_1 nor defect D_2? (2008E.C)

A. 0.13 B. 0.5 C. 0.98 D. 0.87

183. There are three children in a room, ages three, four, and five. If a four -year old child enters a room then which one of the following is true? (2008E.C)

A. Mean age will stay the same but the standard deviation will increase.

B. Mean age will stay the same but the standard deviation will decrease.

C. Mean age and standard deviation will increase.

D. Mean age and standard deviation will stay the same.

184. In how many more ways can 4 people be arranged in a row than if they were arranged in a circle? (2008E.C)

A. 1 B.6 C. 18 D. 12

185. Two machines A and B work independently. The probability that both machines A and B work is 0.4. if the conditional probability that machine B works given that machine A works is 0.5, then the conditional probability that machine A works given that machine B works is_____.(2008E.C)

A. 0.8 B. 0.3 C. 0.5 D. 0.7

186. If there are two children in family, what is the probability that there is at one girl in family?

A. $\frac{1}{2}$ $B.\frac{1}{4}$ $C.\frac{3}{4}$ $D.\frac{2}{3}$

187. Among 2000 student who took a regional exam, the percentile of certain student`s score is 90. Which of the following is correct about the student`s score?

A. The student has answered 90% of the questions correctly.

B. The student`s score is greater than or equal to that of 1800 student.

C. The student`s score is the same as the top 10% of the scores.

D. The score of the student is as good as that of 90% of the student

188. Suppose 2,500 items are produced by a machine and 2% of the product are randomly selected and tested. If 5 of the tested items have a defect, then what is the probability that produced by the machine has No defect?

A. 0.80 B. 0.85 C. 0.90 D. 0.95

189. Fatuma can solve 90% of the problem given in a book and Mesfin can solve 70%. What is the probability that at least one of them will solve the problem, selected at random from the book?

A. 0.77 B. 0.87 C. 0.97 D. 0.67

190. There are three children in a room with ages four, five and six. If a five-year-old child enters the room, then which of the following statement is correct?

A. Mean age will stay the same but the standard deviation will decrease.

B. Mean age will stay the same but the standard deviation will increase.

C. Mean age and standard deviation will increase.

D. Mean age and standard deviation will stay the same.

191. The marks of 50 student is given below

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	8	f_1	10	f_2

If the median of the data is 26, what is the value of f_1 and f_2

A. $f_1 = 7, f_2 = 20$

B. $f_1 = 12, f_2 = 15$

C. $f_1 = 15, f_2 = 12$

D. $f_1 = 20, f_2 = 7$

192.

CHAPTER 6

193. Consider the system $\begin{cases} \propto x + y + z = 1 \\ x + 2y + 4z = 0 \\ 5x - y + z = 0 \end{cases}$

If the determinant of the coefficient matrix is 2, then what is the solution of the system of equations?

A. $\left(3 \propto, \frac{19\propto}{2}, \frac{11\propto}{2}\right)$ C. $\left(\frac{3}{\propto}, \frac{-19}{2}, \frac{11}{2}\right)$

B. $\left(3, \frac{19}{2}, \frac{-11}{2}\right)$ D. $\left(\frac{3}{2}, \frac{19}{2}, \frac{-9}{2}\right)$

194. Suppose that A and B are 3x3 matrices, I is the identity matrix of order 3 such that AB = 2I. If det B = |B| = 6. What is det (A^T)?

A. $\frac{1}{3}$ B. $\frac{4}{3}$ C. 12 D. 48

195. Suppose A = $\begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$. If X is a 2x2 matrix such that AX – A^T= 2A, then what is the value of X?

A. $\begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$ B. $\begin{pmatrix} 3 & 3 \\ 3 & 3 \end{pmatrix}$. C. $\begin{pmatrix} 3 & 6 \\ 6 & 9 \end{pmatrix}$ D. $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

196. Suppose $AX = b$, where A is a 3x3 matrix, $b = (b_1, b_2, b_3)^T$ and $X = (x, y, z)^T$. which one of the following is necessarily true about this system of linear equations?

A. The system has a solution only when det(A) ≠0

B. The cramer's rule is suitable to solve the system if two roes of A are identical

C. If det(A) ≠0 and the second column of A is a multiple of b then $x = 0$

D. If $b = 0$, then $X = (0,0,0)^T$ is the only solution of the system

197. If A= $\begin{pmatrix} 2 & 0 & -1 \\ 1 & 2 & 0 \\ 0 & 0 & -1 \end{pmatrix}$ and $(2A + B)^T = A^T A$, then which one of the following is equal to B?

A. $\begin{pmatrix} 1 & 0 & -2 \\ 2 & 2 & 0 \\ 0 & 0 & 4 \end{pmatrix}$ C. $\begin{pmatrix} 8 & 0 & -4 \\ 4 & 8 & 0 \\ 0 & 0 & -4 \end{pmatrix}$

B. $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$ D. $\begin{pmatrix} 1 & 2 & 0 \\ 0 & 0 & 0 \\ -2 & 0 & 4 \end{pmatrix}$

198. What should be the value of *k* so that the system of equation

$$\begin{cases} x - y + z = 1 \\ -x + 5y - 4z = 1 \\ 2x + 2y - z = k \end{cases}$$ has a solution?

A.0 B. 1 C.- 4 D. 4

199. If M = $\begin{bmatrix} 0 & 1 & 2 \\ 3 & -1 & 0 \\ 5 & 2 & 4 \end{bmatrix}$ and $A^T M = 2I$, where A is a 3x3 matrix and I is the indentity matrix of the order 3, then what is det(A)?

A. 0.2 B. $\frac{4}{17}$ C. 0.8 D. $\frac{1}{17}$

200. Suppose *A* = $\begin{pmatrix} 4 & 0 \\ 1 & 1 \end{pmatrix}$ and *B*= $\begin{pmatrix} 2 & 2 \\ 6 & -4 \end{pmatrix}$. If X is a 2x2 matrix such that $X + \frac{1}{2}B^T = AB$, then *X* is equal to

A. $\begin{pmatrix} 7 & 5 \\ 5 & -4 \end{pmatrix}$ B. $\begin{pmatrix} 5 & -3 \\ 5 & 0 \end{pmatrix}$ C. $\begin{pmatrix} 5 & -3 \\ 5 & -2 \end{pmatrix}$ D. $\begin{pmatrix} 7 & 5 \\ 7 & 0 \end{pmatrix}$

201. Which of the following is equal to

$$\begin{vmatrix} 1 & -a & b-a \\ 1 & b & a+b \\ 0 & c & c+c \end{vmatrix}?$$

A.0 B. -2*ac* C. 2*bc* D. 2*c*(*b*- *a*)

202. If *A* =$\begin{pmatrix} 2 & 7 \\ 1 & 3 \end{pmatrix}$ and $B^{-1} = \begin{pmatrix} 1 & 1 \\ 0 & 2 \end{pmatrix}$, then $(AB)^{-1}$ is equal to

A. $\begin{pmatrix} -2 & 5 \\ 2 & -4 \end{pmatrix}$ B $\begin{pmatrix} -3 & 11 \\ 1 & -3 \end{pmatrix}$ C. $\begin{pmatrix} 4 & -3 \\ 4 & -5 \end{pmatrix}$ D. $\begin{pmatrix} 4 & 0 \\ 0 & 2 \end{pmatrix}$

203. Which of the following is the solution set of

$$\begin{cases} x - y - 2z = 0 \\ -2x + 6z = 1 \\ -x + 2y + z = 1 \end{cases}$$?

A. {(1,0,0,5)} C. $\Re^3$

B. {(3*t* + 1, 0,*t*): *t*∈ $\Re$} D. { }

204. A.0 B .- $\frac{13}{2}$ C. -8 D. any real number

205. Let A and B be 3x3 matrices such that $\begin{bmatrix} 2 & 0 & 0 \\ 1 & 5 & 0 \\ 0 & -1 & \frac{1}{2} \end{bmatrix}$ and $|B| = \frac{1}{10}$

Which one of the following is equal to $|2AB^T|$?

A. 1 B. 4 C. 100 D. 400

206. What is the solution set of the following system of equations

$$\begin{cases} x + y + 2z = 1 \\ x + 2y + z = 2 \\ -2x - 2y - 2z = -2 \end{cases}$$

A. $\{(0,1,0)\}$ C. $\{-3k, k, +1, k) \ / k \in (-\infty, \infty)\}$

B. $(-\infty. \infty)$ D. $\{3k, k, -1, k) \ / k \in (-\infty, \infty)\}$

207. If $\begin{pmatrix} a & 2 & \beta \\ 2 & 1 & 3 \\ -1 & 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}=\begin{pmatrix} -5 \\ 5 \\ 0 \end{pmatrix}$ and the determinant of the coefficient Matrix is -5, then the value of x is equal to

A. 3 B. $a+\beta$ C. $-5a$ D. 5

208. Let A= $\begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix}$ be 2x2 matrix. Then the value of A^{2k+1} for k$\in N$ is equal to?

A. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ B. $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ C. $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

209. Let A= $\begin{bmatrix} -2 & 0 & 5 \\ x & -1 & 1 \\ 2x+1 & 2 & -x \end{bmatrix}$ if the minor of an element 0 is -16, then the possible value of x is

A. 7,-3 B. 1,3 C. 3,-5 D. -3,5

210. Let A and B be 2x2 matrices, which of the following is always true about A and B?

A. $(AB)^T = A^TB^T$ C. AB = BA

B. $(A + B)^T = A^T + B^T$ D. If AB = $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$,and |A|, then B is non singular

211. Let B= $\begin{bmatrix} 1 & -y \\ 0 & 3 \\ 1-x & 2 \end{bmatrix}$ and A = $\begin{bmatrix} -2 & 0 & x \\ 2y & x+y & -4 \end{bmatrix}$ such that $2B^T + A = 0$.

Then which of the following is the value of x?

A. 2 B. 0 C. -8 D. $\frac{-13}{2}$

212. Let A and B be 3x3 matrices such that |A| = 1/5 and B= $\begin{bmatrix} 2 & 0 & 0 \\ 3 & 5 & 0 \\ 4 & -1 & 1/2 \end{bmatrix}$

Which one of the the following is equal to $|2A^tB|$

A. 1 B. 2 C. 4 D. 100

213. If $\begin{bmatrix} x & -3 \\ -1 & y \end{bmatrix}$ is the inverse of $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ then the value of y is

A. $\frac{-3}{2}$ B. 1 C. 2 D. 3

214. If A = $\begin{bmatrix} y & -1 \\ 3y & 1 \end{bmatrix}$ then for what values of y is Det(2A) = y^2

A. -8 B. 4 C. 8 D. 16

215. If $A = \begin{pmatrix} 1 & x \\ -4 & 3 \end{pmatrix}$ is an invertible matrix and $|A^{-1}| = 1$, then what is the value of x?

A/ -1 B/ 2 C/ $\frac{-1}{2}$ D/ $\frac{1}{2}$

216. If A = $\begin{pmatrix} 0 & x & 0 \\ 1 & -1 & 1 \\ 0 & y & -1 \end{pmatrix}$ and A^{-1} = $\begin{pmatrix} 1 & 1 & 1 \\ 3 & 0 & 0 \\ 2 & 0 & -1 \end{pmatrix}$, then what are the values of x and y ?

A. $x = 3, y = -2$ C. $x = -3, y = 2$

B. $x = \frac{2}{3}, y = \frac{1}{3}$ D. $x = \frac{1}{3}, y = \frac{2}{3}$

217. If A= $\begin{pmatrix} 3 & -2 & 8 \\ 0 & 6 & 7 \\ 0 & 4 & 5 \end{pmatrix}$, then det(A^T A) is equal to_____.

A. 12 B. 36 C. 30 D. 15

218. Consider the following system of equations: $\begin{cases} ax + by = 2 \\ x + 3y + 2z = 0 \\ 2x + y + z = 0 \end{cases}$

If the determinant of the coefficient matrix is 2, then what is the solution set of the system?

A. $\{(1, 3, -5)\}$ B. $\left\{\left(\frac{1}{a}, \frac{1}{b}, 0\right)\right\}$ C. $\{(-2, -6, 10)\}$ D. $\emptyset$

219. What is the solution set of the system $\begin{cases} x + y - z = 1 \\ x + 2y - 3z = 1 \\ 2x + 3y - 4z = 2 \end{cases}$

A. $\{(0, 2, 1)\}$ C. $\{(2k + 1, -k, k) l\ k \in \Re\}$

B. $\{(1 - k, 2k, k,) l\ k \in \Re\}$ D. $\emptyset$

220. Suppose that $A = \begin{pmatrix} 4 & 2 & x \\ y & 6 & 1 \\ -2 & 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 4 \\ 0 & 3 \\ 5 & -1 \end{pmatrix}$ are given if the (1,2) entry of the product AB is 11, what is the value of x?

A/ $\frac{3}{5}$ B/ 11 C/ -2 D/ -8

221. What is inverse of $A = \begin{pmatrix} -5 & 4 \\ -3 & 2 \end{pmatrix}$

A/ $\begin{pmatrix} 1 & -2 \\ \frac{3}{2} & -5/2 \end{pmatrix}$ B/ $\begin{pmatrix} -1 & 2 \\ \frac{-3}{2} & \frac{5}{2} \end{pmatrix}$ C/ $\begin{pmatrix} \frac{3}{2} & \frac{-5}{2} \\ 1 & -2 \end{pmatrix}$ D/ $\begin{pmatrix} -1 & -2 \\ \frac{-3}{2} & \frac{5}{2} \end{pmatrix}$

222. Given that $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix} = 30$, what is the value of $\begin{vmatrix} a_1 + b_1 & a_2 + b_2 & a_3 + b_3 \\ b_1 & b_2 & b_3 \\ c_{1-a_1} & c_{2-a_2} & c_{3-a_3} \end{vmatrix}$?

A/ 22 B/ 30 C/ 58 D/ 0

223. What is the solution set of the system $\begin{cases} -x + 2y - z = 1 \\ -x + y + 2z = -2 \\ x - y = -1 \end{cases}$

A/ $\left\{\left(\frac{-5}{2}, \frac{-3}{2}, \frac{-3}{2}\right)\right\}$ B/ $\{(-5, -3, -3)\}$

C/ $\left\{\left(\frac{-3}{2}, \frac{3}{2}, \frac{-5}{2}\right)\right\}$ D/ $\{(-3, 3, -5)\}$

224. If $A = \begin{pmatrix} 2 & 7 \\ 1 & 3 \end{pmatrix}$ and $B^{-1} = \begin{pmatrix} 1 & 1 \\ 0 & 2 \end{pmatrix}$, then $(AB)^{-1}$ is equal to:(2008E.C)

A. $\begin{pmatrix} 4 & -3 \\ 4 & -5 \end{pmatrix}$ **B.** $\begin{pmatrix} -2 & 5 \\ 2 & -4 \end{pmatrix}$ **C.** $\begin{pmatrix} -3 & 11 \\ 1 & -3 \end{pmatrix}$ **D.** $\begin{pmatrix} 4 & 0 \\ 0 & 2 \end{pmatrix}$

225. Let $A = \begin{pmatrix} 0 & \alpha & \beta \\ 2 & 2 & 1 \\ 3 & 1 & 2 \end{pmatrix}$, $b = \begin{pmatrix} 6 \\ 0 \\ 0 \end{pmatrix}$, and $X = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$. if det(A) = 3, then what is the solution set of the system $AX = b$? (2008E.C)

A. $\{(6, \quad -2, \quad -8)^T\}$ C. $\{(-3, \quad 1, \quad 4)^T\}$

B. $\{(0, \quad \frac{1}{a}, \quad \frac{5}{b})^T\}$ D. $\emptyset$

226. For any $n \times n$ *square matrix* A, Which one of the following is true? (2008E.C)

A. $det(A) = -det(A^T)$, *where* A^T *is the tranpose of* A

B. *if* k *is scalar* , *then* $det(kA) = k^n det(A)$

C. *if* B *is a matrix obtained from* A *by interchanging of two rows of* A, *then* $det(B) = det(A)$

D. *If* A *is invertable* , *then* $det(A) = det(A^{-1})$

227. The solution of the system of linear equation of $\begin{cases} x - 3y - 2y = 6 \\ 2x - 4y - 3z = 8 \\ -3x + 6y + 8z = -5 \end{cases}$ **(2008E.C)**

A. $x = -1, y = -3, z = -2$ C. $x = 1, y = -3, z = 2$

B. $x = -1, y = -3, z = 2$ D. $x = 1, y = 3, z = -2$

228. If $\begin{vmatrix} -1 & 1 & 2 \\ 3 & 2 & x \\ 2 & 4 & 1 \end{vmatrix} = \begin{vmatrix} -x & 3 & 2 \\ 2 & 2 & 3 \\ 1 & -1 & -2 \end{vmatrix}$, then what is the value of x?

A. $\frac{2}{5}$ $B. -\frac{2}{5}$ $C. \frac{2}{3}$ $D. -\frac{2}{3}$

229. Consider the following system of equation: $\begin{cases} x - 2y + z = 1 \\ -x + y + z = 3 \\ 3x - 5y + z = k \end{cases}$

How much must be the value of k so that the system has a solution?

A. 7 B. 1 C. 0 D. -1

230. If A is a 3×3 matrix and det (A) =5, then how much is det ($2A^TA$)?

A. 200 B. 100 C. 50 D. 20

231. If $2\begin{pmatrix} 2x & x \\ -5 & -3 \end{pmatrix}^{-1} = \begin{pmatrix} 3 & 2 \\ -5 & -4 \end{pmatrix}$, then what is the value of x?

A. -2 $B. 2$ $C. \frac{1}{2}$ $D. -\frac{1}{2}$

232.

CHAPTER 7

233. In the set of complex numbers, which one of the following is the solution set of $z^3 - iz^2 + 2z = 0$?

A. {0} B. {0,-*i*}C. {0, -*i*. 2*i*} D. {0, *i*, -2*i*}

234. Which one of the following is the simplest form of $|3+4i| - \frac{25i}{3+4i}$?

A. 5-5*i* B. 5+5*i* C. 1+3*i* D. 1-3*i*

235. If $z = \cos(\frac{\pi}{10}) + i \sin(\frac{\pi}{10})$, then what is the value of z^5?

A. $\frac{\pi}{2} + \frac{\pi}{2}$ B. $\frac{1}{2} + \frac{1}{2}i$ C. *i* D. 1+*i*

236. If z = x + yi is a complex number, then $|z|^2 + \frac{1}{2}(z - \bar{z})^2 = 1$ is equivalent to which one of the following equations?

A. $x^2 - y^2 = 1$ B. $x^2 - 3iy^2 = 1$ C. $x^2 - y^2 = 2$ D. $2x^2 - y^2 = 2$

237. If $w = \frac{16i}{1+i} + (1 - 3i)^2$ and $z = |w| + \bar{w}$, which one of the following is the simplest form of z?

A. $\sqrt{2}$+2i B. 2 + 2i C. 4-2i D. 2 - 2i

238. Let z be a complex number. Which of the following is the solution set of $z^3 - iz = 0$?

A. $\left\{\frac{+}{-}\frac{1}{\sqrt{2}}(1+i)\right\}$ C. $\left\{\frac{+}{-}\sqrt{2}(1+i)\right\}$

B. $\left\{0\frac{+}{-}\frac{1}{\sqrt{2}}(1-i)\right\}$ D. $\left\{0\frac{+}{-}\frac{1}{\sqrt{2}}(1+i)\right\}$

239. In the set of complex numbers, the solution set of $x^2 - 2x + 5 =$ is

A. $\emptyset$ C. $\{1 + 2i, 1 - 2i\}$

B. $\{2 + i, 2 - i\}$ D. $\{2 + 4i, 2 - 4i\}$

240. If $z = \frac{3+i}{i-2}$ is a give complex number, then what is the conjugate, $\bar{z}$, of z?

A. $\bar{z} = \frac{-3+i}{i+2}$ C. $\bar{z}$, = -6 – 2*i*

B. $\bar{z} = \frac{i-3}{2-i}$ D. $\bar{z}$ = -1 – *i*

241. What is the principal argument of $(5+5i)^{11}$?

A. $\frac{\pi}{2}$ B. $\frac{2\pi}{3}$ C. $\frac{\pi}{4}$ D. $\frac{3\pi}{4}$

242. What are the values of u and v that satisfy the equation: $\frac{u+3i}{4-2i} = \frac{2+vi}{20}$?

A. $u = 2,\ v = 3$ C. $u = 2,\ v = 16$

B. $u = -6, v = 10$ D. $u = -4, v = 6$

243. Which of the following are the values of y and z respectively if

$$\begin{pmatrix} y & 0 \\ -2 & x+1 \end{pmatrix}\begin{pmatrix} 2 & 1 \\ 3 & z-1 \end{pmatrix} = \begin{pmatrix} -10 & -5 \\ 0 & -7 \end{pmatrix}?$$

A. $\frac{1}{3}$, -5 B. $5, \frac{-1}{3}$ C. $-5, \frac{-11}{4}$ D. $\frac{11}{4}, 5$

244. Which one of the following is the simplest form of $\frac{4-3i}{3+4i} + \overline{1-2i}$?

A.1+I B.1+3i C.2-I D.1-3i

245. In the set of complex numbers, the solution set of $x^2 - 4x + 5 = 0$ *is*:

A. $\emptyset$ C. $\{1 + 2i, 1 - 2i\}$

B. $\{2 + 3i, 2 - 3i\}$ D. $\{2 + i, 2 - i\}$

246. Let z be a complex number such that $\left|\frac{3z}{-4+3i}\right| = (2 - i)(\overline{2 - i})$. then , the modulus of z is equal to:

A. $\frac{25}{3}$ B. $\frac{10}{3}$ C. $\frac{14}{3}$ D. $\frac{25}{9}$

247. In the set of complex numbers, the solution set of $z^3 - 8 = 0$ *is*:

A. {2} C. $\left\{2, \left(cos\frac{2\pi}{3} + isin\frac{2\pi}{3}\right), \left(cos\frac{4\pi}{3} + isin\frac{4\pi}{3}\right)\right\}$

B. $\left\{2, 2\left(cos\frac{2\pi}{3} + isin\frac{2\pi}{3}\right), 2\left(cos\frac{4\pi}{3} + isin\frac{4\pi}{3}\right)\right\}$ D.{2, 2+8i, 2-8i}

248. If the complex number a+bi corresponds to the point(a,b), to what point does $2i - \pi i$ correspond?

A. $(2-\pi, 0)$ B. $(2, -\pi)$ C. $(0, 2-\pi)$ D. . $(2, \pi)$

249. Which of the following is a polar form of $\left(\frac{2}{1+\sqrt{3}\,i}\right)^2$?

A. $\text{Cos}120^0 + i\sin 120^0$ C. $\cos 60^0 + i \sin 60^0$

B. $\text{Cos}240^0 + i \sin 240^0$ D. $-\cos 120^0 + i\sin 120^0$

250. Which one of the following statement is true about a complex number z ?

A. Multiplying z by i translate z by 1 unit.

B. Dividing z by i rotates z clock wise by 180^0.

C. Multiplying z by –i rotates z counterclockwise by 180^0.

D. Multiplying z by –i rotates z counterclockwise by 90^0.

251. In the set of complex numbers, what is the solution set of $x^2 + 4x + 5 = 0$?(2008E.C)

A. $\emptyset$ **B.** $\{1-2i,\ 1+2i\}$ **C.** $\{2-i,\ 2+i\}$ **D.** $\{-2-i, -2+i\}$

252. If $z = (1+i)^{10}$, then which of the following is equal to z ? (2008E.C)

A. $1 + 32i$ **B.** $32i$ **C.** $10i$ **D.** $1 + 10i$

253. *If* $Z = \frac{2-4i}{1+i}$ *then the modulus of the conjugate of* $Z, |\bar{Z}|$ *is*: (2008E.C)

A. $\sqrt{10}$ **B.** $3\sqrt{2}$ **C.** $2\sqrt{3}$ **D.** $2\sqrt{2}$

254. Which one of the following is the multiplicative inverse of $z = \frac{3+4i}{4-5i}$?

A. $\frac{8}{25} - \frac{31}{25}\,i$ C. $-\frac{8}{25} - \frac{31}{25}\,i$

B. $-\frac{8}{25} + \frac{31}{25}\,i$ D. $\frac{8}{25} + \frac{31}{25}\,i$

255. Let z be a complex number and $w = 3 + 4i$. $If\ \frac{z^2+1}{z+i} = |w|z - \frac{1}{i}\bar{w}$, then what is the value of z?

A. $-4 - 2i$ $B. 4 - 2i$ $C. -1 + i$ $D. -1 - i$

256. What is the polar form of $\frac{7-i}{3-4i}$?

A. $\sqrt{2}\ (\cos\frac{\pi}{2} + i\sin\frac{\pi}{2})$ C. 2 $(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2})$

B. $\sqrt{2}\ (\cos\frac{\pi}{4} + i\sin\frac{\pi}{2})$ D. 2 $(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4})$

257.

CHAPTER 8

258. If A = (-2,3), B = (3,1) and C is any other point on the plane, then which one of the following is the coordinate form of $\overrightarrow{AC}$ - $\overrightarrow{AC}$?

A. (-5,2) B. (5, -2) C. (1, 4) D. (-1, -4)

259. What is the equation of a line that passes through the point (-1,2) and parallel to the vector(1,1)?

A. $2x-y = 1$ B. $x + y - 1 = 0$ C. $x - 2y = 3$ D. $y - 2x + 1 = 0$

260. What is the image of the line given by $(x,y) = (-1,0) + t(3,6)$, $t \in \mathcal{R}$, under the translation that takes (1,0) to (0,1) followed by the reflection about the line $y = 2x$?

A. $y = 2x + 3$ B. $y = 2x - 3$ C. $y = 2x + 6$ D. $y = 2x - 5$

261. If a point (2,5) is reflected under a line to the point (-3,1), what is the line of reflection?

A. $2x + 3y = 7$ B. $x + 3y = 7$ C. $8y + 10x = 19$ D. $2x + 3y + 5 = 0$

262. Suppose $\vec{A} = \overrightarrow{3i}$ - $\overrightarrow{4j}$ and $\vec{B}$ is a vector in the *xy* – plane such that the angle between $\vec{A}$ and $\vec{B}$ is $\frac{\pi}{3}$. If $\vec{u}$ is the unit vector in the direction of $\vec{B}$, then $\vec{A}$. ($\vec{A}$ - $\overrightarrow{2u}$)is equal to:

A. 20 B. 5 C. 15 D. 30

263. If ℓ is the line passing through (0, 2) and parallel to V= $\vec{i}$ + 3$\vec{j}$, which one of the following is true about ℓ and the circle (x – 2)^2 + (y – 1)^2= 5?

A. ℓ is tangent to the circle at (0, 2)

B. ℓ is tangent to the circle at some point *P*

C. ℓ is tangent to the circle at two distinct points

D. The distance between ℓ and the center of the circle is greater than $\sqrt{5}$

264. If a translation T takes the circle $x^2 + y^2$ - 2x + 6y+3 = 0 into the circle whose equation is (x + 2)^2 + (y – 4)^2 = 7, then what is the image of the origin under *T* ?

A. (-3, 7) B. (1, 2) C. (1, -3) D. (-2, 4)

265. If $\overrightarrow{A}$ is perpendicular to $\vec{B}$, what is the cosine of the angle between $\vec{A}$ and $\vec{A} - \vec{B}$?

A. $\frac{\|\vec{A}-\vec{B}\|}{\|\vec{A}\|}$ B. $\frac{\|\vec{A}-\vec{B}\|}{\|\vec{B}\|}$ C. $\frac{\|\vec{A}\|}{\|\vec{A}-\vec{B}\|}$ D. $\frac{\|\vec{B}\|}{\|\vec{A}-\vec{B}\|}$

266. Which one of the following is necessarily true?

A. If $\|\vec{A}\| = \|\vec{B}\|$, then $\vec{A} = \vec{B}$

B. $\|\overrightarrow{kA}\| = k\|\vec{A}\|$, for any teal number k

C. If $\vec{A}$ is parallel to $\vec{B}$, then $\vec{A}, \vec{B}$ = 0

D. If $\vec{u}$ *is* a unit vector in the direction of$\vec{A}$, then $\vec{A}, \vec{u} = \|\vec{A}\|$

267. A line given by a vector equation r*(t)* = (0,3) + *t*(1,1) is tangent to a circle at point(0,3). If the radius of the circle is $\sqrt{2}$, which one of the following is the center of the circle?

A. (1, 4) B. (1, -1) C. (-1, 2) D. (1, 2)

268. What is the image of the ellipse whose equation is $2(x+2)^2 - (y-1)^2 = 2$ under a translation that takes (2, 1) to (4, 0) followed by a rotation of 90^0?

A. $x^2 + 2y^2 = 2$ C. $2(x-4)^2 - y^2 = 2$

B. $2x^2 + y^2 = 2$ D. $(x-4)^2 + 2y^2 = 2$

269. If $\vec{u}$ = (-3, x) and $\vec{v}$ = (x, y -2) are vectors, what is the value of y so that

$\vec{u} + \vec{v} = 3\vec{u} - \frac{1}{2}\vec{v}$?

A. $\frac{2}{3}$ B. $-\frac{10}{3}$ C. -4 D. $-\frac{22}{3}$

270. Suppose *p*(1,2,1) and *Q*(1,0,2) are points in space and $\vec{A} = \overrightarrow{PQ}$. If $\vec{B}$ is parallel to $\overrightarrow{PQ}$ and $\overrightarrow{B}$ is parallel to $\overrightarrow{PQ}$and $\vec{A} \cdot \vec{B}$ = -10, then which one of the following is true?

A. $\vec{A}$ and $\vec{B}$has the same direction C. $\|\vec{B}\| = \frac{1}{10}\|\vec{A}\|$

B. $\|\vec{B}\| = 10\|\vec{A}\|$ D. $\|\vec{B}\| = 2\|\vec{A}\|$

271. Let i and j be the standard unit vectors in the directions of positive x-axis and positive y-axis, respectively, and $\overline{AB}$ be a vector from the point $A(-1,0)$ *to the point* $B\ (2,2)$, If $\bar{v}$ = 3$\overline{AB}$ - 3i + 2j, then the unit vector in the direction of $\bar{v}$ is equal to

A. $\left(\frac{3}{5}, \frac{4}{5}\right)$ B.$\left(\frac{-3}{5}, \frac{4}{5}\right)$ C. $\left(\frac{-3}{5}, \frac{-4}{5}\right)$ D. $\left(\frac{3}{5}, \frac{-4}{5}\right)$

272. Let ℓ be the line whose equation is 2x –y = 10. Which one of the following is the equation of the image of ℓ after a reflection in the line y= 2x-5 followed by a rotation through the angle of 90^0 about the origin?

A. $x + 2y = 0$ B. $2x + 2y = 0$ C. $x + 2y = 5$ D. $x - 2y = 5$

273. A patrol boat on a sea sailed from its station 10km to the south and then changed its course and sailed $5+\sqrt{6}$km in the direction N 600E, Then what is the distance the bat should travel in order to return to its station by the shortest route?

A. $4\sqrt{6}$km B. $3\sqrt{6}$km C. 9km D. 7km

274. Which of the following is a vector that lies on the line through (0,0) and (2,4)?

A. $\bar{u}=(2,1)$ B. $\bar{u}=(-1,-2)$ C. $\bar{u}=\left(\frac{1}{2},2\right)$ D. $\bar{u}=(-2,-6)$

275. If the translation T takes the point (1 ,2) to the point (3,4), then which of the *following* is the image of the line $2x + 3y + 6 = 0$ under T ?

A. $2x + 3y -16 = 0$ C. $2x + 3y – 4 = 0$

B. $2x + 3y + 16 = 0$ D. $3x + 2y -4 = 0$

276. The equation of the image of the line y = x+1 after a rotation about the origin through 90^0 in a counterclockwise direction is

A. $y = -x$ B. $y = x-1$ C. $y = x+1$ D. $y = x-1$

277. If the line $3x - 4y + 10 = 0$ is translated by T to $3x – 4y + 27 = 0$ and the image of point (0, 1) by T is (3, *t*), then which of the following is the value of *t* ?

A. -3 B. -2 C. -1 D. 0

278. If $\vec{A}$ and $\vec{B}$ are vectors such that $|\vec{A}| = 4$, $|\vec{B}| = \sqrt{3}$ and $\vec{A} \cdot \vec{B} = -3$, then what is the magnitude of $\vec{A} - \vec{B}$?

A. 5 B. 7 C. $\sqrt{13}$ D. $\sqrt{22}$

279. The angle between the vectors $\vec{u} = \vec{\imath} - \vec{\jmath}$ and $\vec{v} = 2\vec{\jmath}$ is

A. $\pi/4$ B. $\pi/2$ C. $\frac{2}{3}\pi$ D. $\frac{3}{4}\pi$

280. Let $\vec{u}$ = (-1, 10) and $\vec{v}$ = (1,3). A unit vector in the direction of $\vec{u} - 2\vec{v}$ is

A. (-3/5 , 4/5) B. (-3/5, 3/5) C. (3/5, -4/5) D. (3/5, 4/5)

281. Which one of the following pairs of vectors are NOT parallel?

A. (2, 1) & (4, 2) B. (6, 4) & (3, 2) C. (-1, 1) & (1, -1) D. (1, 2) & (3, 4)

282. Which one of the following is the image of the point p = (4, 1) after a reflection by the line x – y + 1 = 0?

A. (-4, 3) B. (0, 5) C. (-1, 8) D. (-3, 4)

283. If $\overrightarrow{a}=(1,2), \overrightarrow{b}=(-1,2)\ and\ \overrightarrow{c}=(-3,4)$ are vectors, then which of the following is TRUE?

A. $\|\overrightarrow{a}\| \neq \|\overrightarrow{b}\|$ C. $3\overrightarrow{c}+\overrightarrow{b}-\overrightarrow{a}=(11,12)$

B. $\|-2\overrightarrow{c}-2\overrightarrow{b}\|=4\sqrt{13}$ D. the length of $\overrightarrow{a}+\overrightarrow{c}-\overrightarrow{b}\ is\ 25.$

284. If a straight line passes through the point (1, 0) and the center of the circle whose equation is $x^2 + y^2 – 4x + 2y +1 = 0$, then which one of the following is the parametric vector equation of the line?

A. $(x,y)=(1,0)+t(2,-1)$ C. $(x,y)=(1,0)+t(-2,1)$

B. $(x,y)=(2,-1)+t(1,0)$ D. $(x,y)=(1,0)+t(-1,1)$

285. If $\overrightarrow{u}$ and $\overrightarrow{v}$ are vectors such that $\|\overrightarrow{u}\|=4$ and $\|\overrightarrow{v}\|=\sqrt{3}$ and $\overrightarrow{u}.\overrightarrow{v}=-3$, then what is the magnitude of $\overrightarrow{u}-\overrightarrow{v}$?

A. $\sqrt{13}$ B. 7 C. $\sqrt{22}$ D. 5

286. The angle between $\overrightarrow{u} = \overrightarrow{\imath} - \overrightarrow{\jmath}$ and $\overrightarrow{v} = 2\overrightarrow{\jmath}$ is:

A. $\frac{\pi}{4}$ B. $\frac{\pi}{2}$ C. $\frac{2\pi}{3}$ D. $\frac{3\pi}{4}$

287. Let $\overrightarrow{a} = (-2, 8)$ and $\overrightarrow{b} = (1, 3)$. A unit vector in the direction of $\overrightarrow{b} + \frac{1}{2}\overrightarrow{a}$ is:

A. $(-1, 0)$ B. $(0, 1)$ C. $\left(\frac{1}{4}, \frac{\sqrt{3}}{2}\right)$ D. $\left(\frac{-3}{5}, \frac{4}{5}\right)$

288. If $\left\|\overrightarrow{A}\right\| = 3$ and $\overrightarrow{B}$ is a unit vector that makes an angle of $\frac{\pi}{3}$ with vector $\overrightarrow{A}$, then $\left\|\overrightarrow{A} - 2\overrightarrow{B}\right\|$ is equal to:

A. $\sqrt{5}$ B. $\sqrt{7}$ C. $\sqrt{8}$ D. $\sqrt{19}$

289. What translation vector takes the parabola $x - y^2 - 2y = 0$ to $x - y^2 = 0$?

A. $(0, 1)$ B. $(-1, 1)$ C. $(1, 1)$ D. $(-1, -1)$

290. Suppose that the equation of a line ℓ is given by $\ell: 2x - 3y - 7 = 0$. What is a parametric form of the equation of line ℓ ?

A. $(x, y) = (0, 7) + \lambda(2, -3)$ C. $(x, y) = (-3, -4) + \lambda(1, -6)$

B. $(x, y) = (2, -1) + \lambda(3, 2)$ D. $(x, y) = (-4, 2) + \lambda(1, 5)$

291. What is the image of the circle $x^2 + (y - 3)^2 = 4$ after it is reflected in the line y-x=0?

A. $x^2 + (y + 3)^2 = 4$ B. $x^2 + y^2 - 6x + 5 = 0$

C. $x^2 + y^2 + 6x = 4$ D. $x^2 + y^2 - 6y = -5$

292. If $\overrightarrow{A} = 4\,\overrightarrow{i} - 3\overrightarrow{j}$ and $\overrightarrow{u}$ is a unit vector such that $\left|\overrightarrow{A} + \overrightarrow{u}\right|^2 = 27$, then the cosine of the angle between $\overrightarrow{A}$ and $\overrightarrow{u}$ is equal to _____.

A. 0.1 B. 0.3 C. 0.3 D. 0.4

293. If A = (1, -2), B = (-3, 2) and $\overrightarrow{V}$ is a position vector such $2\overrightarrow{V} + \overrightarrow{AB} = \overrightarrow{0}$, then $\overrightarrow{V}$ is equal to _____.

A. (2, 0) B. (-1, 0) C. (-2, 2) D. (2, -2)

294. If the tail of a vector $\vec{u}$ is the origin and its head is at the point $(2, -2\sqrt{3})$, then what are the magnitude and direction angle, respectively, of $\vec{u}$?

A/ -6; 30^0 B/ 12; 60^0 C/ -4; 60^0 D/ 4; 300^0

295. What is the image of the circle $(x - 2)^2 + y^2 = 5$ after it is reflected in the line y= -x?

A. $x^2 + y^2 + 4x = 1$ C. $x^2 + y^2 - 4y = 1$

B. $x^2 + y^2 - 4x = 1$ D. $x^2 + y^2 + 4y = 1$

296. Let $\vec{u} = (-2,5)$ *and* $\vec{v} = (2,4)$, which one of the following is equal to $2\vec{u} - \frac{1}{2}\vec{v} - 3\overrightarrow{j}$?

A. (-5,5) B.(-5,9) C. (-8, 9) D. (-8, 12)

297. If the standard form of the equation of the line is: $l: 3y - 2x + 3 = 0$, then what is the vector form of ?

A. r = (2,-3)+ t(-2, 1) C. r = (0,1)+ t(2, -3)

B. r = (1,-2)+ t(0, 3) D. r = (0,-1)+ t(3, 2)

298. Which of the following is a vector parallel and opposite direction to $\vec{A} = 3\vec{\imath} - 4\vec{j}$?

A. $\vec{\imath} - \frac{4}{3}\vec{j}$ B. $\frac{-3}{2}\vec{\imath} + 2\vec{j}$ C. $\frac{3}{5}\vec{\imath} + \frac{4}{5}\vec{j}$ D. $-6\vec{\imath} - 8\vec{j}$

299. What is the image of point (-2, 3) in reflection about the line x= -1 ?

A. (0, 3) B. (-1, 2) C. (1, 0) D. (1, 3)

300. A translation T(x, y)= (x-h, y-k) takes the line –x+5y = 2 to the line –x +5y = 10, which of the following relationship is true?

A. h-5k = 8 B. h- 5k = -8 C. –h +5= 10 D. –h +5k = -10

301. Suppose $\vec{A} = 3\vec{\imath} - \vec{j} + \vec{k}$ and $\vec{B}$ is a vector in space such that $\overrightarrow{||B||} = \vec{A}.\vec{B}$. if $\vec{u}$ is the unit vector in the direction of $\vec{B}$, then $|\vec{A} + \vec{u}|$ is equal to:

A.16 B.12 C. 10 D. 14

302. What is the value k, for which the two vectors $\vec{u} = \begin{pmatrix} 1 \\ k \\ -3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 2k \\ -5 \\ 4 \end{pmatrix}$ are perpendicular?(2008)

A. 4 B. -4 C. 3 D. -3

303. If $\vec{A}$ and $\vec{B}$ are parallel vectors with opposite directions and $|\vec{B}| = |2\vec{A}|$, then $\vec{B} - \vec{A}$ is equal to: (2008)

A. $\vec{A}$ B. $-\vec{A}$ C. $-3\vec{A}$ D. $3\vec{A}$

304. If $\vec{u}$ is a unit vector in the direction of $\vec{A}$ and $|\vec{A}| = 4$, then $\vec{A}.\vec{u}$ is equal to_____(2008)

A. ¼ B. 4 C. ½ D. 2

305. If $\vec{V} = \overrightarrow{AB} + 3\overrightarrow{BA}$, where A and B are distinct points in the coordinate plane, then which one of the following is equal to $3\vec{V}$? (2008)

A. $6\overrightarrow{AB}$ B. $-6\overrightarrow{AB}$ C. $12\overrightarrow{AB}$ D. $-12\overrightarrow{AB}$

306. The image of a figure with vertices A(1, 2), B(3, 6), C(-1, 2), and D(-2, -2) after reflection across the x-axis is: (2008)

A. A'(1, -2), B'(-3, -6), C'(1, -2), and D'(2, 2)
B. A'(1, -2), B'(-3, 6), C'(1, -2), and D'(2, -2)
C. A'(1, -2), B'(3, -6), C'(-1, -2), and D'(-2, 2)
D. A'(1, -2), B'(3, 6), C'(-1, 2), and D'(-2, -2)

307. When the plan is rotated 45° about the point (1,-2) then what would be the image of the point (2, 4)?

A. $\left(1 - \frac{5\sqrt{2}}{2}, -2 + \frac{7\sqrt{2}}{2}\right)$ C. $\left(\frac{5\sqrt{2}}{2}, \frac{7\sqrt{2}}{2}\right)$

B. $\left(1 - \frac{\sqrt{2}}{2}, -2 + \frac{\sqrt{2}}{2}\right)$ D. $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

308. Let L be the line given by the vector equation (x,y)=(1)+$t(\sqrt{3}, 1), t \in R$. what is the equation of the image of L after being rotated 15^0 about (1,1) and then translated by vector U=(-1,1)?

A. $-x + y = 2$ C. $\sqrt{3}x - y = 2$

B. $x - y = 2$ D. $y - x + \sqrt{3}y = 1$

309. If the angel between the vector $\underset{A}{\rightarrow}$= (2,-1, 1) and $\underset{B}{\rightarrow}$ = (1, 1,α) is $\frac{\pi}{3}$, then what is the value of α ?

A. 1 B. -1 C. 2 D. -2

310. $\boldsymbol{If U = 2\vec{j} - \vec{k}}$ and V= $v = \vec{\imath} - 8\vec{j} + 3\vec{k}$, then what is the unit vector in the direction of 5u+v?

A. $\vec{\imath} + 2\vec{j} - 2\vec{k}$ **C.** $\frac{\overrightarrow{1}}{3}\imath + \frac{2}{3}\vec{j} - \frac{2}{3}\vec{k}$

B. $\frac{\overrightarrow{2}}{3}\imath + \frac{1}{3}\vec{j} - \frac{2}{3}\vec{k}$ D. $\frac{1}{3}\vec{\imath} + \frac{2}{3}\vec{j} + \frac{2}{3}\vec{k}$

311.

CHAPTER 9

312. If $f(x) = 2 - \frac{1}{2}sin\left(\frac{\pi}{2}x\right)$, then which one of the following is the amplitude and period of *f*, respectively?

A. $\frac{1}{2}$ and 4 B. $\frac{-1}{2}$ and 4 C. 2 and π D. $\frac{1}{2}$ and π

313. Suppose that an airplane is descending at a speed of 50 miles per hour at an angle of 30^0 below the horizontal line. What is the *x*- and *y*- components, respectively, of the velocity of the plane?

A. $50\sqrt{3}, 25$ B. $-25, 50\sqrt{3}$ C. $25-25\sqrt{3}$ D. $25\sqrt{3}, -25$

314. An observer on level ground is at a distance $10\sqrt{3}$ m from a building. The angles of elevation to the bottom of the windows on the second and third floors are 30^0 and 60^0, respectively. What is the distance h between the bottoms of the windows?

[*you may use the values: sin* $30^0 = cos60^0 = \frac{1}{2}$ *and Sin* $60^0 = cos\ 30^0 = \frac{\sqrt{3}}{2}$]

A. 15m B. 20m C. $15\sqrt{3}$ m D. 32m

315. If θ = 2 arctan $\left(\frac{1}{2}\right)$, then which one of the following is equal to sec (θ)

A. $\frac{25}{3}$ B. $\frac{4}{5}$ C. $\frac{5}{3}$ D. $\frac{5}{4}$

316. What is $\cot(\arcsin x)$ if 0 < x < 1 ?

A. $\frac{x}{\sqrt{1-x^2}}$ B. $\sqrt{1-x^2}$ C. $\frac{1}{x}\sqrt{1-x^2}$ D. $\frac{1}{\sqrt{1-x^2}}$

317. What is the solution set of $\cos^2 x + \frac{1}{2}\sin 2x = 1\ in\ the\ interval\ [\ 0, 2\pi)$?

A. $\left\{0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}\right\}$ C. $\{\ 0, \pi\ \}$

B. $\left\{0, \frac{\pi}{4}, \frac{3\pi}{4}, \pi\right\}$ D. $\left\{0, \frac{\pi}{4}, \pi\right\}$

318. Which one of the following is equal to $\sec\left(\frac{\pi}{2}\ x\right)$ $\sin^3 x + \cos 2x$?

319. $2\cos x$ B. $2\sin x$ C. $\cos^2 x$ D. $\sin^2 x$

320. Line ℓ passes through (0,5) and (-5,0). What is the angle between the y-axis and ℓ in radian measure?

A. $\frac{\pi}{4}$ B. $\frac{\pi}{3}$ C. $\frac{\pi}{2}$ D. $\frac{3}{4}\pi$

321. Which one of the following is a simplified form of $\csc(\frac{\pi}{2} - x)\cos x - sin^2 x$?

A. $2\cos x$ B. $\cos^2 x$ C. $2 \sin x$ D. $\sin 2x$

322. $\cos(tan^{-1}(0.5))$ is equal to:

A. $\frac{1}{\sqrt{5}}$ B. $\frac{1}{\sqrt{3}}$ C. $\frac{2}{\sqrt{5}}$ D. $\frac{1}{\sqrt{3}}$

323. The simplest form of the expression $sin(sin^{-1} - cos^{-1})$ $for\ 0 < x < 1\ is$

1. $1 - x^2$ B.$\sqrt{1 - x^2}$ C. 1 D. $2x^2 - 1$

324. What is the value of $\tan(sin^{-1}(\frac{1}{3}))$

A. $\frac{1}{\sqrt{2}}$ B. $\frac{\sqrt{2}}{4}$ C. $\frac{\sqrt{2}}{8}$ D. $\frac{\sqrt{2}}{16}$

325. Which one of the following identity is incorrect?

A. $cos^4 - sin^4 = cos2x$ C. $\frac{1+sinx-cos2x}{cos+sin2x} = tanx$

B. $\frac{1-cos2x}{1+cos2x} = tan^2x$ D. $\frac{1-tanx^2}{1+tanx^2} = sin2x$

326. The angles of elevation of the top of a tower from the top and bottom of a building 100 meters tall are 30^0 and 45^0 respectively. What is the height of the tower (assume that the tower and the building are at the same level)

A. 100√3 m B. $\frac{100\sqrt{3}}{\sqrt{3}-1}m$ C. $100(\sqrt{3}+1)m$ D. $50(\sqrt{3}+1)m$

327. If $\sin x = \frac{3}{5}\ and\ 0 < x < \frac{\pi}{2}$, then what is the value of $\cos\frac{1}{2}x$?

A. $\frac{4}{5}$ B. $\frac{3}{\sqrt{10}}$ C. $\frac{1}{\sqrt{10}}$ D. $\frac{3}{4}$

328. Which one of the following is the solution set of the equation

$2^{cos^2 x} = 2^{sin^2 x + \frac{1}{2}}$ in the interval $[0,2\pi]$

A. $\{\frac{-1}{2}, \frac{1}{2}\}$ B. $\{\frac{\pi}{6}, \frac{5\pi}{6}\}$ C. $\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{11\pi}{6}\}$ D. $\{\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}\}$

329. Which one of the following is the solution set of the equation $\sin 2x - \sin x = 0$ in the interval $[0, 2\pi]$?

A . $\{0, \frac{\pi}{3}, \frac{5\pi}{3}\}$ B. $\{0, \frac{\pi}{6}, \frac{11\pi}{6}\}$ C. $\{0, 2\pi, \frac{\pi}{6}, \frac{11\pi}{6}\}$ D .$\{0, \pi, \frac{\pi}{3}, \frac{5\pi}{3}\}$

330. $\boldsymbol{sin(cos^{-1}\sqrt{x})\ for\ 0 < x < 1\ is\ equal\ to}$?

A. $\sqrt{1 - x^2}$ B. $\sqrt{1 + x^2}$ C. $\sqrt{1 + x}$ D. $\sqrt{1 - x}$

331. Two ships, one with angle of depression 60^0 due east and the other with 30^0 due west are observed from a plane 1,000 meters above a sea. If the two ships are on the same line, what is the distance between the two ships?

[*you may use the values: sin 30^0 = cos 60^0 =* $\frac{1}{2}$ and sin 60^0 = cos 30^0 = 32.]

A. $\frac{1}{\sqrt{3}}$ 4,000m B. $\sqrt{3}$ 500m C. 2,000m D. $\frac{1}{\sqrt{3}}$ 600m

332. What is the amplitude and period, respectively, of the graph of $f(x)$ = -6 sin xCos x ?

A. 3, π B. 6, π C. 3, $\frac{\pi}{2}$ D. 6, 2 π

333. What is the work done (in Joules) when a force of 50 Newton is used to pull a crate 20 meters along a level path if the force is at an angle of 60^0?

[Remember that: Work = (Force) x (distance travelled).]

A. 360 B. 500 C. 760 D. 1500√2

334. What is the possible value of x that solves the equation: $sin^{-1}x + \cos^{-1}\left(\frac{3}{5}\right) = \pi$?

A. $\frac{\pi}{3}$ B. $\frac{3}{5}$ C. $\frac{5\pi}{2}$ D. $\frac{4}{5}$

335. If angle θ is an acute angle of a right triangle, what is the length of the side adjacent to θ, given that the hypotenuse has 6 units length and sec θ = 10/3?

A. 1.8units B. 2 units C. 18 units D. 20 units

336. $cos\left(sin^{-1}\frac{1}{2}\right)$ is equal to:

A. ½ B. $\frac{\sqrt{2}}{2}$ C. 0 D. $\frac{3}{2\sqrt{3}}$

337. $cos^2A - cos^4A \; is \; equal \; to$

A/ $cos^2A \; sin^2A$ C/ $\frac{1}{4}sin^22A$

B/ cos^22A D/ $-(sin^2A + cos^4A)$

338. If $f(x) = 3 + \frac{1}{3}\; sin\left(\frac{4\pi}{3}x - \frac{5\pi}{7}\right)$, then what are the amplitude and period of the graph of f.

A/ $3, \frac{7}{5}\pi$ B/ $\frac{1}{3}, \frac{3}{4}\pi$ C/ $\frac{1}{3}, \frac{3}{2}$ D/ 3,5

339. The simplified form of $\frac{\tan x}{1-\tan^2 x}$ is:

A/ Cos 2X B/ $\frac{1}{2}\; cos2x$ C/ $\frac{1}{2}\; tan2x$ D/ Sec 2x

340. 3 tan 930^0 +sin 1200^0-cos1410^0 equals:

A/ 0 B/ $-\sqrt{3}$ C/ $2\sqrt{3}$ D/ $\sqrt{3}$

341. Which of the following is a correct identity?

A. $(sec^2x)(tan^2x) = 1$ C. $\frac{sin^2x}{cosx} + cosx = secx$

B. $\frac{sinx}{cscx} - \frac{cosx}{secx} = 1$ D. $sin^2x - cos^2x = 1$

342. Which of the following is equal to $sec\left(sin^{-1}\left(\frac{3}{5}\right)\right)$?

A. $\frac{4}{3}$ B. $\frac{5}{4}$ C. $\frac{4}{5}$ D. $\frac{5}{3}$

343. What is the solution set of the equation $sin^2x + \; 1 = cos^2x + \frac{1}{2}$, in the interval [0, 2π]?

A. $\{\frac{\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}\}$ C. $\{\frac{\pi}{2}, \frac{\pi}{6}\}$

B. $\{0, \frac{3\pi}{2}, \pi\}$ D. ∅

344. If $f(x) = 3 - \frac{1}{2}\cos(\frac{2\pi}{3}x - \frac{5\pi}{7})$, then what are the amplitude and period of the graph of f?

A. $3, \frac{5\pi}{7}$ B. ½,3 C. ½ , $\frac{3\pi}{2}$ D. 3,5

345. What is the value of $\arctan(tan\frac{2}{3}\pi)$?

A. $\frac{\pi}{3}$ B. $-\frac{\pi}{3}$ C. $\frac{\pi}{6}$ D. $-\frac{\pi}{6}$

346. Which of the following is true about the function $f(x) = \; -2sin\frac{x}{3}$?

A. The period of f is $\frac{2}{3}\pi$. C. f(x)< 0 for 0 <x< 3π

B. If $x \in [3\pi, 6\pi], then \; f(x) \in [0,1]$ D. the graph of f is increasing on [0,2 π]

347. What is the simplified form of $\sin\left(x - \frac{\pi}{2}\right) tanx$?

A. –sinx B. –cosx C. sinx D. cosx

348. On the interval [0, 2π], what is the solution set of $sin2x = cosx$?

A. $\{\frac{\pi}{2}, \frac{3\pi}{2}\}$ B.$\{\frac{\pi}{2}, \frac{\pi}{6}, \frac{3\pi}{2}\frac{5\pi}{6}\}$ C. $\{\frac{\pi}{6}, \frac{5\pi}{6}\}$ D. $\{\frac{\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}\}$

349. In the interval [0, π], what is the solution set of the equation $2sin^2x - cosx - 1 = 0$?

A. $\{0, \pi\}$ B.$\{\frac{\pi}{3}, \frac{2\pi}{3}\}$ C. $\{\frac{\pi}{3}, \pi\}$ D. $\{\pi\}$

350. What is the period of the function $f(x) = \tan\left(\frac{2(x-\pi)}{3}\right)$?

A. 2π B. $\frac{2\pi}{3}$ C. π D. $\frac{\pi}{2}$

351. What is the value of $arcsin\left(\frac{-\sqrt{2}}{2}\right)$? (2008)

A. $\frac{\pi}{4}$ B. $\frac{\pi}{2}$ C. $-\frac{\pi}{4}$ D.$-\frac{\pi}{2}$

352. What is the amplitude and period, respectively, of the graph of $f(x) = 4sin\left(\frac{x}{3}\right)cos\left(\frac{x}{3}\right)$? (2008)

A. 4, $\frac{\pi}{3}$ B. 2, 3π C. 2, $\frac{2\pi}{3}$ D. 4, 3π

353. A boat on a sea sailed from its station toward north with constant speed of 80 km/h. Another boat from the same station sailed 60^0NE(north East) with constant speed of 100km/h. If the two boats started sailing at the same time, what is the straight distance between them after they have sailed for just 30 minutes? (2008)

A. $10\sqrt{42}$km B. 90km C. $10\sqrt{41}$ km D. $10\sqrt{21}\ km$

354. If $cot(\theta) = 2, then\ which\ of\ the\ following\ is\ equal\ to\ csc(\theta)$? (2008)

A. $\sqrt{5}$ B. $\frac{2}{\sqrt{5}}$ C. ½ D. $\frac{1}{\sqrt{5}}$

355. If $\theta = tan^{-1}(\frac{3}{4})$, then which of the following is equal to $cos(2\theta)$? (2008)

A. 9/16 B. 9/25 C. 16/25 D. 7/25

356. If $cot\theta = \sqrt{8}, and\ \theta$ is a first quadrant angle, then what is the value of $csc\theta$? 2009

A. 1/3 B. 3 C. $\frac{\sqrt{8}}{3}$ D. $\frac{1}{\sqrt{8}}$

357. If $\theta = arctan(2), then\ what\ is\ the\ value\ of\ sin(2\theta)$? 2009

A. $\frac{2}{5}$ B. $\frac{4}{5}$ C. $\frac{4}{\sqrt{5}}$ D. $\frac{2}{\sqrt{5}}$

358. Which one of the following is true? 2009

A. The amplitude of $f(x) = sin3x\ is\ 3$.

B. The period of $f(x) = 2sin4x\ is\ \pi$.

C. The period of $f(x) = 3cos\left(\frac{1}{2}x - \frac{\pi}{3}\right)\ is\ 4\pi$

D. The amplitude of $f(x) = -5cos(3x + 2) - 2\ is\ 7$.

359. What is the period and range of $f(x) = 5sin\left(\frac{1}{3}x + 2\right) + 3$?(2010)

A. $p = 6\pi, range = [-5, 5]$ C. $p = 6\pi, range = [-2, 8]$

B. $p = \frac{2}{3}\pi, range = [-5, 5]$ D. $p = \frac{2}{3}\pi, range = [-2, 8]$

360. If in ΔABC, $AB = 3, BC = 4\ and\ m(< B) = 60°, then$ what is the length of AC and the cosine of <A, respectively? (2010)

A. $\sqrt{13}\ and \frac{1}{\sqrt{13}}$ C. $\sqrt{13}\ and \frac{6}{5\sqrt{13}}$

B. $\sqrt{13}\ and \frac{-1}{\sqrt{13}}$ D. $\sqrt{13}\ and \frac{-6}{5\sqrt{13}}$

361. If θ is a fourth quadrant angle and sec $\theta = \sqrt{2}$ then what is csc θ equals to?(2010)

A. $\frac{-1}{\sqrt{2}}$ B. $\frac{1}{\sqrt{2}}$ C. $\sqrt{2}$ D. $-\sqrt{2}$

B. What is the value of cost 270°+ 2 cos 90%+ 4 $\sec^2$ 180° ?

C. -2 B. 8 C. 4 D. 7

362. What is the value of cost 270°+ 2 cos 90%+ 4 $\sec^2$ 180° ?

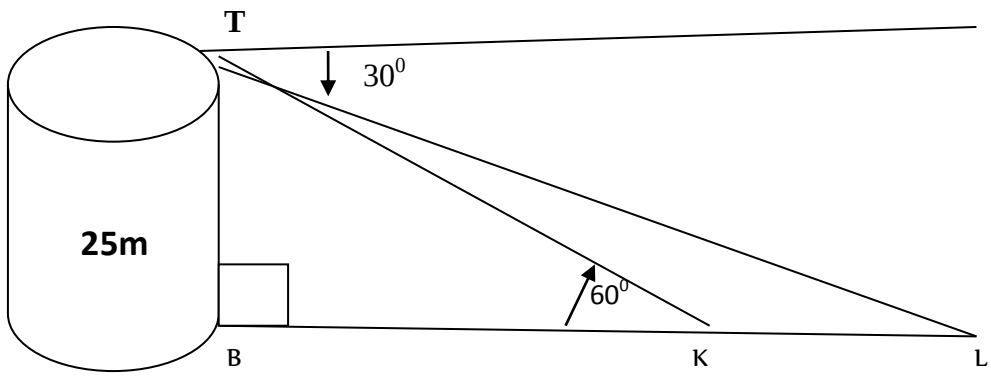
A. -2 B. 8 C. 4 D. 7

363. Ship A and B depart from the same point at the same time on the course N60°E and N40°E, respectively. If the speed of ship A 20 km per hour and speed of ship B is 30km per hour, what is the distance between the two ship just after 30 minutes of their departure?

[*you may take*: $\cos(40°) = 0.77$, $\cos(20°) = 0.94$, $\sin(20°) = 0.34$]

A. $\sqrt{40}$ Km B. $\sqrt{43}$ Km C. $\sqrt{50}$ Km D. $\sqrt{53}$ Km

364. The diagram below is a representation of a 25 m vertical observation tower TB and two cars K and L on a road. The angel of depression from T to car L is 30°. The angle of elevation from car K to the top of the tower is 60°. B,K and L lie in a straight line and lie on the same horizontal plane as the base the tower.



What is the distance between the two cars?

A. $\frac{50\sqrt{3}}{3}$ m B.$50\sqrt{3}$ m C. $\frac{50\sqrt{3}}{2}$ m D.$50+\sqrt{3}$ m

365. What is the solution set of $\sin^2 x - \sin x \cos x = 0$ over $[0, 2\pi]$?

A. $\left\{0, \pi, \frac{5\pi}{4}, 2\pi\right\}$ C. $\left\{0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}, 2\pi\right\}$

B. $\left\{0, \frac{\pi}{4}, \pi, 2\pi\right\}$ D. $\left\{0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}\right\}$

GRADE 12

CHAPTER 1

Directions: Solve each of the following questions and choose the best answer to the problem from the given alternatives. Write the letter of your choice in capital letter

1. A certain meeting hall has 20 rows of seats. There are 20 seats in the first row, 22 seats in the second row, 24 seats in the third row, and so on. How many seats are there on the last (20th) row of the hall?
   A. 46 B. 58 C. 760 D. 5240
2. Which one of the following is an arithmetic sequence?
   A. 3, 5, 7, 9, 11, ...
   B. 3, 6, 12, 24, 48, ...
   C. -3, 6, -9, 12, -15, ...
   D. 1, 3, 6, 10, 15, 21, ...
3. Which one of the following sequence is a convergent sequence?
   A. $1, \frac{1}{2}, 1, \frac{1}{3}, 1, \frac{1}{4}, \ldots$
   B. $\{(-1)^n\}_{n=1}^{\infty}$
   C. $\left\{10^{109} - \frac{1}{100}\right\}_{n=1}^{\infty}$
   D. $\left\{sin\left(\frac{1}{n}\right)\right\}_{n=1}^{\infty}$
4. What is the sum of all multiples of 3 between 20 and 200?
   A. 7,227 B. 6,570 C. 6,150 D. 5, 166
5. A ball is thrown vertically from ground up to a height of 16m. Each time it drops h meters, it rebounds 0.80h m. noting that the ball travels every height of h twice, what is the total vertical distance travelled by the ball before it comes to rest?
   A. 40*m* B. 80*m* C. 160*m* D. 320*m*
6. In an arithmetic sequence, the 4th term is 42 and the 10th term is 30. What is the maximum possible partial sum?
   A. 1200 B. 900 C. 450 D. 600
7. The sum of whole numbers that are less than 100 and leave remainder 2 when divided by 5 is equal to:

   A. 990 B. 988 C. 1976 D. 899

8. The sum of the infinite series $\frac{1}{3} - \frac{2}{3^2} + \frac{2^2}{3^3} - \frac{2^3}{3^4} + \cdots$ is equal to:

   A. $\frac{1}{7}$ B. $\frac{2}{5}$ C. $\frac{3}{5}$ D. $-\frac{1}{5}$

9. If the 4th and 7th terms of a geometric sequence are -1/4 and -2 respectively, then which of the following is not true?

   A. The first term is -1/32
   B. The common ratio is 2
   C. The 4th term is 4 times the 2nd term.
   D. The 5th term is -1.

10. Let $a_n = n + \cos n\pi$, n=1,2,3… be the nth term of a sequence. Then which of the following is true?
    A. The fifth term is 6
    B. The 10th term is 9
    C. $a_7 + a_8 = 15$
    D. $a_7 - a_6 = 1$
11. If $\{A_n\}$ is an arithmetic sequence with first term $A_1 = 5$ and fifth term $A_5 = 21$, then the partial sum $\sum_{n=1}^{20} A_n$ is equal to:
    A.760 B.780 C.860 D.870

12. What is the sum of the series $\sum_{n=0}^{\infty} 2^n 3^{2-n}$?

A. 6 B.18 C.27 D. ∞

13. The sequence $\left\{\frac{(n-1)(2n+1)}{1-n^2}\right\}_{n=1}^{\infty}$ converges to:

A. $-\infty$ B. -2 C. 0 D. 1

14. Which one of the following represents is a geometric sequence?

A. 3,1, $\frac{1}{3}.\frac{1}{9},\frac{1}{27}$, … C.1,3,6,10,15, …

B. $\frac{1}{2},-\frac{1}{3}.\frac{1}{4},-\frac{1}{5},\frac{1}{6}$… D. -3,6,-9,12,-15, …

15. What is the actual value of the sum $\sum_{n=1}^{\infty}(\frac{2^n+5^n}{10^n})$?

A. 0.325 B. 1 C. $\frac{5}{4}$ $\frac{37}{9}$

16. What is the sum of the series $\sum_{n=1}^{\infty}(-1)^n 3^{-2n}$?

A. $\frac{-1}{8}$ B. -0.13 C. -0.1 D. $\frac{1}{8}$

17. A ball is thrown vertically from ground up to a height of 16m. each time it drops h meters, it rebound 0.8h m. noting that the ball travels every height of h twice, what is the total vertical distance traveled by the ball?

A. 40m B.80m C. 160m D. 320m

18. The sequence $\left\{\frac{(n-1)(2n+1)}{1-n^2}\right\}_{n=1}^{\infty}$ converges to:

A. $-\infty$ B. -2 C. 0 D. 1

19. What is the 50th term of the sequence 3, 10, 17, 24, 31,…?

A. 310 B. 346 C. 510 D. 531

20. If $\{a_n\}$ is a sequence such that $a_1 = 2\ and\ a_{n+1} = a_n$+4 for all n≥ 1, $then\ \sum_{n=1}^{35} a_n$ is equal to:

A. 2460 B. 2458 C. 2450 D. 2442

21. What is the sum of the series $\sum_{n=1}^{\infty}(\frac{2^{2n+1}}{5^{n-1}})$?

A. 40 B. 20 C. 10 D. 8

22. What is the limit of the sequence 1,- $\frac{1}{3},-\frac{1}{3},\frac{1}{5},\frac{1}{5},-,\frac{1}{7}-\frac{1}{7}$, …?

A. -1 or 1 B. 0 C. e D. does not exist

23. If a geometric progression $G_2 = -10, G_4 = -\frac{8}{5}\ and\ G_5\ is\ positive$, then which of the following is a general formula for G_n?

A.$25(-\frac{2}{5})^{n-1}$ B. $-25(\frac{2}{5})^{n-1}$ C. $\frac{2^{n-1}}{(-5)^{n-2}}$ D. $25(-\frac{2}{5})^n$

24. What is the sum of the first 20 terms of the sequence 3, 7, 11, 15,…?

A.741 B. 820 C. 899 D.903

25. If the kth term of a sequence is $a_k = \frac{(-1)^k(2-k)}{2k-1}$, what is its next term a_{k+1} when k is even?

A. $\frac{k-1}{2k+1}$ B. $\frac{k-1}{2k+3}$ C. $\frac{k-3}{2k+1}$ D. $\frac{k+3}{2k+1}$

26. Suppose a geometric sequence $\{G_n\}_{n=1}^{\infty}$has terms $G_{10} = 192\ and\ G_6 = 12$. which of the following is equal to G_2 ?

A. $\frac{3}{2}$ B. $\frac{3}{4}$ C. $\frac{3}{8}$ D. $\frac{3}{16}$

27. Consider the sequence $\{a_n\}$, $n \geq 1$, where the first term is $a_1 = 2\ and\ a_{n+1} = a_n + 4$ for all $n \geq 1$. then, the sum $a_3 + a_4 + a_5 + \cdots . + a_{35}$ is equal to:

A. 2460 B. 2458 C. 2442 D. 2450

28. The sum of the series $\sum_{n=1}^{\infty}\frac{(-1)^n}{(3^n)^2}$ is equal to:

A. $\frac{9}{8}$ B. $\frac{9}{10}$ C. $-\frac{9}{10}$ D. $-\frac{1}{10}$

29. Which one of the following sequence is a divergent sequence?

A. $\{(\sqrt{2})^{-n}\}$ C. $\{(\frac{\pi}{3})^n\}$

B. $\{5^{\frac{1}{n}}\}$ D. $\{1+\frac{(-1)^n}{7^n}\}$

30. Which one of the following is true about $\{2+\frac{(-1)^n}{n+1}\}$

A. The least upper bound of the sequence is 7/3 C. 1.6 is its lower bound

B. The sequence is monotonic D. $2-\frac{1}{10}$ is a term of the sequence

31. What is the sum of the series $\sum_{n=1}^{\infty}[(-\frac{1}{3})^n+4^{1-n}]$?

A. $\frac{1}{12}$ B. $\frac{19}{12}$ C. $\frac{13}{12}$ D. $\frac{25}{12}$

32. Which of the following is a divergent sequence?

A. $\{5^{\frac{1}{n}}\}$ B.$\{\cos(\frac{3}{n})\}$ C. $\{(\frac{-3}{4})^n\}$ D.$\{\frac{(-1)^n}{10}\}$

33. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence such that $a_{n+1}=-na_n$, $a_1=1, n=1,2,3,\ldots$ which of the following is not true about the sequence?

A. $a_1=2$ B. $a_4=-3$ C. $a_n>0$ if n is odd D. $a_n<0$ if n is even

34. Let $S_n=4n^2, n=1,2,3,\ldots$ *be* the sum of the first n terms of a sequence $\{a_n\}_{n=1}^{\infty}$. which of the following is the third term a_3?

A. 8 B. 12 C. 16 D. 20

35. Consider the sequence $\{a_n\}_{n\geq 1,}$ where the first term is $a_1=2$, and $a_n=3a_{n-1}\ for\ all\ n\geq 2. then, \sum_{i=1}^{20} a_i\ is\ equal\ to$

A. $3^{20}-1$ B. $3^{-20}-1$ C. $1-\frac{1}{3^{20}}$ D. $1-\frac{1}{2^{21}}$

36. Which of the following is not true about $\left\{\frac{e^n}{3^n(n+5)}\right\}$?

A.It converges to 0 C. It is bounded

B.It is decreasing D. It diverges

37. Suppose that every year the amount of atoms of certain radioactive substance is half of its previous year. If there were 6.4×10^8 atoms of the substance during the initial observation, how many atoms of the substance are present by the end of 20 years after the initial observation?(2008)

A. 3.2×10^{-20} B. $2^{-20}\times10^8$ C. $2^{-14}\times10^9$ D. $2^{-14}\times10^7$

38. If $\{A_n\}_{n=1}^{\infty}$ is an arithmetic sequence such that its 1st term $A_1=-5$ and its 5th term $A_5=15$, then its 11th term A_{11} is equal to(2008)

A. 40 B. 50 C. 45 D. 55

39. What is the sum of all multiples of 4 that are between 30 and 301? (2008)

A. 12,882 B. 11,288 C. 6,288 D. 6,882

40. The nth term of the sequence: 1, -4, 9, -16, … is : (2008)

A. $a_n=(-2)^n$ C. $a_n=(-1)^{2n}n^2$

B. $a_n=(-1)^n n^2$ D. $a_n=(-1)^{n-1}n^2$

41. The sum of $\sum_{n=0}^{\infty}5(\frac{2}{3})^n$ is _____(2008)

A. 0 B. 15 C. 10/3 D. 5

42. In which interval the sequence $\left\{\frac{(-1)^n}{3n}\right\}_{n=1}^{\infty}$ is bounded? (2008)

A. $\left[\frac{-1}{9},\frac{1}{12}\right]$ B. $\left[\frac{-1}{3},\frac{1}{6}\right]$ C. $\left[\frac{-1}{6},\frac{1}{3}\right]$ D. $\left[\frac{-1}{12},\frac{1}{9}\right]$

43. What is the sum of the infinite series $\sum_{n=1}^{n=\infty}(\frac{1}{n+1}-\frac{1}{n})$? (2008)

A. 98/101 **B. 100/101** **C. -98/101** **D. -100/101**

44. What is the sum of the series $\sum_{n=0}^{\infty} 3^n \times 2^{-2n}$?

A. ∞ **B. 4** **C. 6** **D.3/2**

45. Which of the following relations holds for the sequence: -10, -3, 4, 11, …?(2009)

A. $a_n = a_{n-1} - 8$ **C.** $a_n = a_{n-1} - 7$

B. $a_n = a_{n-1} + 7$ **D.** $a_n = a_{n-1} + 8$

46. $What\ is\ the\ sum\ of\ \sum_{n=1}^{30}(-1)^n\left(\frac{1}{n}+\frac{1}{n+1}\right)$? **(2009)**

A. $\frac{-29}{30}$ B. $\frac{29}{30}$ C. $\frac{30}{31}$ D. $\frac{-30}{31}$

47. **Which of the following is the sum of the series** $5 - \frac{10}{3} + \frac{20}{9} - \frac{40}{27} + - \cdots$?**(2009)**

A. -5 B. -3 C. 3 D. 5

48. Suppose a radioactive material loses one-third of its mass per year. If its current mass is 81g, then how much will its mass be just after 7 years? (2009)

A. 27g B. $\frac{1}{27}$ g C. $\frac{128}{27}$ g D. $\frac{128}{81}$ g

49. **Which of the following is a convergent sequence?(2009)**

A. $\left\{(\frac{5}{3})^n\right\}$ B. $\left\{\frac{2n}{n+1}\right\}$ C. $\left\{\frac{n^2}{n+1}\right\}$ D. $\left\{\frac{(-1)^n}{3}\right\}$

50. $If\ a_{1,} = 2, a_2$=6, $a_{3,} = 10$, a_4=14 …. $then\ \sum_{n=1}^{100} an =$ ----------

A. 20,020 B. 20,200 C. 20,000 D. 22,000

51. Everyday a person saves 5 cents more than the amount he saved on the previous day. His target is to save the total amount of 3225 cent by the end of 30 days. How much must be the starting saving to meet the target?

A. 35 cent B. 25cent C. 50 cent D. 60 cent

52. If the second and fifth terms of a geometric progression are $-\frac{1}{2} and \frac{1}{16}$ respectively, what is the sum of first eight terms of the sequence?

A. $\frac{85}{128}$ $B.\frac{255}{256}$ $C.\frac{128}{85}$ $D.\frac{256}{255}$

53. What is the sum of the infinite series $\sum_{k=0}^{\infty} 5\left(\frac{2^k+5^k}{10^k}\right)$?

A. 15 B. $\frac{25}{4}$ $C.5$ $D.\frac{65}{4}$

54.

CHAPTER 2

55. The least upper bound of the sequence $\left\{\frac{(-1)^n}{n+1}\right\}$ is

A. 0 B. $-1/2$ C. $1/3$ D. 1

56. To which of the following is $\lim_{x\to -1^+} \frac{x^2-1}{|x+1|}$ equals to ?

A. 4 B. 0 C. -1 D. -4

57. Which one of the following is equal to $\lim_{x\to 9} \frac{x-9}{3-\sqrt{x}}$?

A. 6 B. -3 C. -6 D. ∞

58. The ozone level (in ppb – parts per billion) on a sunny day in a metropolitan area is given by the formula: $p(t) = 80+12t - t^2$, where t is time in hours and $t = 0$ corresponds to 9 A.M. What is the rate of increase of the ozone level after 3 hours (i.e. at 12A.M.) ?

A. Ppb B. 12ppb C. 107ppb D. 113ppb

59. Let $f(x) = \begin{cases} a\frac{\sin 2x}{x}, if\ x < 0 \\ e^{2x} - 2, if\ x \geq 0 \end{cases}$

If f is continuous at $x = 0$, then what is he value of a ?

A. $\frac{1}{2}$ B. 2 C. $\frac{-1}{2}$ D. -2

60. Which one of the following is equal to $\lim_{x\to\infty} \left(\frac{3x}{3x+2}\right)^{-3x}$?

A. e^2 B. e^{-3} C. e^{-2} D. e^3

61. $\lim_{x\to\infty} \left(\frac{x}{x-1}\right)^{1-x}$ is equal to:

A/ e B/ $\frac{1}{e}$ C/ -e D/ 1-e

62. $\lim_{x\to 0} \frac{(x+2)^{\frac{3}{2}}-2\sqrt{2}}{x}$ equals:

A/ 3/2 B/ $3\sqrt{2}$ C/ $\frac{3\sqrt{2}}{2}$ D/ 1

63. $\lim_{x\to 2} \frac{\tan(x-2)}{\sqrt{x}-\sqrt{2}}$ is equal to:

A/ $\sqrt{2}$ B/ 1 C/ 2 D/ $\sqrt{8}$

64. $\lim_{x\to\infty} \left(1+\frac{1}{x}\right)^{2x+4}$ *is equal to*

A. e B. e^2 C. ∞ D. e^4

65. which one of the following is equal to $\lim_{x\to\infty} \left(\frac{x}{x+2}\right)^{-3x}$

A. e^6 B. e^{-3} C. $e^{-3/2}$ D. e^{-6}

66. $\lim_{x\to 0} \frac{xcsc3x}{x+1}$ *is equal to*:

A. $\frac{1}{3}$ B.0 C. 4 D. 3

67. *If* $a_n = (\frac{n+3}{n+1})^n$, then the limit of the sequence $\{a_n\}_{n=1}^{\infty}$ is equal to:

A. 1 B. $\frac{1}{2}$e C. e^2 D. $+\infty$

68. which of the following is equal to $\lim_{n\to\infty}\frac{3\sqrt{n}-6n+5}{4n+1}$?

A. $\frac{-3}{2}$ B.0 C. $\frac{3}{4}$ D. $\frac{5}{4}$

69. If $a_n=\frac{1}{n^2}+\frac{2}{n^2}+\cdots+\frac{n}{n^2}$, then what is the limit of the sequence $\{a_n\}_{n=1}^{\infty}$

A. 0 B. ½ C. 7/8 D.+ ∞

70. Given that $\lim_{x\to3}f(x)=5$ and $\lim_{x\to3}g(x)=11$, what is the value of $\lim_{x\to3}\left(\frac{(f(x)-g(x))(g(x)-2f(x))}{g(x)^2-f(x)^2}\right)$?

A. $-\frac{66}{96}$ B. .$-\frac{1}{16}$ C. 0 D. does not exist

71. Let $f(x)=\begin{cases}\frac{asinx}{x-|x|}, & if\ x<0\\ e^{-x}+cosx, & if\ x\geq0\end{cases}$. If f is continuous at x=0, then what is the value of a?

A. 4 B.2 C. $\frac{1}{2}$ D. -4

72. Let f: $\mathcal{R}\to\mathcal{R}$ be a continuous function such that f(2)=2/3 and f(0)=3.Then $\lim_{x\to0} f\left[\frac{(e^x-1)}{x^2}sin2x\right]$ equals:

A/ 3 B/ 2/3 C/ 2 D/ doesn't exist

73. If f (x) =x^2+2lnx , then what is $\lim_{h\to0}\frac{f(2+h)-f(2)}{h}$?

A. 5 B.4 C.2 D.0

74. What is the value of $\lim_{x\to\infty}(1+\frac{1}{x})^{\frac{-x}{2}}$?

A. $\frac{1}{\sqrt{e}}$ B. $\sqrt{e}$ C. e^{-2} D. ∞

75. Which of the following is equal to $\lim_{n\to\infty}\frac{1-n-3n^2}{6n^2+1}$?

A. $\frac{1}{6}$ B.$-\frac{1}{2}$ C.$-\frac{1}{6}$ D.$-\infty$

76. Let $f(x)=\begin{cases}3^x+k, & if\ x\leq0\\ 3\frac{\sin(2x)}{x}, & if\ x>0\end{cases}$ if f is continuous at x= 0, then what is the value of k?

A. 6 B. 5 C. 2 D. 0

77. Which of the following is equal to $\lim_{x\to1}\frac{\sqrt{x}-1}{x^2-1}$?

A. $\frac{1}{2}$ B. $\frac{1}{4}$ C. 0 D. ∞

78. Which of the following is equal to $\lim_{x\to1}\frac{1-x}{1-\frac{1}{x^2}}$?

A. 1 B. $\frac{-1}{2}$ C. 0 D. doesn't exist

79. For a real number s, the function f(x) is defined by $f(x)=\begin{cases}\frac{4}{x^2-4}-\frac{1}{x-2}; & for\ x\neq2\\ s & ;x=2\end{cases}$ which value of s make the function f(x) continuous for all x>0?

A. $-\frac{1}{4}$ B.$-\infty$ C.0 D. 2

80. Which of the following is equal to $\lim_{x\to0}\frac{cos^2x-1}{xsin2x}$?

A. -1 B. $-\frac{1}{2}$ C. 1 D. $\frac{1}{2}$

81. $\lim_{n\to\infty}\frac{2n^2-n+1}{6n^2+1}$ is equal to

A. 2 B. 1/3 C. 2/3 D. ∞

82. $\lim_{x\to 1} \frac{x^3+x-2}{x^2-x}$ is equal to

A.-2 B. 1 C. 4 D. does not exist

83. What is the left hand limit, $\lim_{x\to 0^-} \frac{|x|-xe^x}{x}$?

A. 0 B.-2 C. -1 D. does not exist

84. Let $f(x) = \begin{cases} a - cosx, & x \le 0 \\ 3e^x - a, & x > 0 \end{cases}$ for what value of a is f a continuous function ?

A.1 B. 3/2 C. 2 D.3

85. Let $a_n = \frac{n}{1-n}(\frac{3}{\pi})^n$. then $\lim_{n\to\infty} a_n$ *is equal to*:

A. $-\infty$ B.-1 C. 0 D. ∞

86. Which of the following is equal to $\lim_{x\to 4} \frac{\sqrt{x}-2}{x^2-4x}$?

A. 0 B.1/4 C. 1/8 D.1/16

87. What is the value of $\lim_{x\to+\infty}(\frac{x+4}{x-1})^x$?

A. 0 B. 1 C. e D. e^5

88. For a non zero real number k, let the function f be defined by $f(x) = \begin{cases} \frac{tankx}{x}, & x < 0 \\ 3x + 2k^2, & x \ge 0 \end{cases}$

Which one of the following value of k make the function f continuous at x=0?

A. $\frac{\pi}{2}$ B. $\frac{\pi}{4}$ C. $\frac{1}{2}$ D. -1

89. A function f is defined by $f(x) = \begin{cases} x^2 - kx - 1, if\ x \le 3 \\ 2 + kx - x^2, if x > 3 \end{cases}$ then the value of k such that f is continuous at x=3 equals:

A. 5 B. $\frac{1}{6}$ C. $\frac{7}{2}$ D. 2.5

90. Let $f(x) = \frac{\sqrt{x}-2}{-\frac{4}{x}+1}$. Then, $\lim_{x\to 4+} f(x)$ is equal to:

A. 0 B.1/4 C. 1 D.$-\infty$

91. $\lim_{x\to 2} \frac{6x-12}{x^2-x-2}$ *is equal to* :

A. 0 B.2 C. 1 D.∞

92. Which of the following is equal to $\lim_{x\to\pi} \frac{xsin2x}{x-\pi}$?

A.2 π B. π C.0 D.1

93. The left hand limit, $\lim_{x\to 0^-} \frac{|x|-2xe^x}{x}$ *is equal to*:

A. 0 B.-2 C. -3 D. does not exist

94. Which of the following is equal to $\lim_{n\to\infty} \frac{n+cos3n}{2-n}$?

A. -1 B. 0 C.1 D. 3

95. Let $f(x) = \begin{cases} 3a - x, & if\ x < 1 \\ b + 1, & if\ x = 1 \\ ax, & if\ x > 1 \end{cases}$ what is the value of b if f is continuous at x = 1?

A. $-\frac{1}{2}$ B. $\frac{1}{2}$ C. -1 D. 3

96. On which of the following intervals is f continuous, where $f(x) = \begin{cases} \frac{x-x^2}{x-1}, & x < 0 \\ 3 - x, & x \ge 0 \end{cases}$,

A.$(-\infty, 0]$ B. [-2, 1] C. [-1, 2] .$[0, \infty)$

97. The left hand limit, $\lim_{x\to 0^-} \frac{xe^x-|x|}{x}$ is equal to_____ (2008)

A. 0 B. 2 C. 1 D. does not exist

98. Which one of the following is equal to $\lim_{x\to 0} \frac{2x+tanx}{xsecx}$? (2008)

A. 2 B. 0 C. 1 D. 3

99. Which one of the following is true about the function f defined by $f(x) = \begin{cases} \frac{x^2}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$? (2008)

A. f is continuous except at x =0.
B. f has an infinite discontinuity at x = 0.
C. f is continuous everywhere
D. f has x = 0 as a vertical asymptote

100. $\lim_{x\to\infty} xsin\frac{1}{x}$ *is equal to*: (2008)

A. 0 B. 1 C. ∞ D. -1

101. Which one of the following is equal to $\lim_{x\to 16} \frac{\sqrt{x}-4}{x-16}$? (2008)

A. ∞ B. 4 C. 1/8 D. ¼

102. What is the value of $\lim_{n\to\infty} \frac{(-1)^n(n+1)}{n^2+1}$? (2008)

A. 0 B. ∞ C. -1 D. does not exist

103. Which one of the following is equal to $\lim_{x\to\infty}(\frac{2x}{2x-1})^x$? (2008)

A. $\sqrt{2e}$ B. e^{-2} C. $\sqrt{e}$ D. ∞

104. $\lim_{x\to 2^-} \frac{x|x-2|}{x-2}$ is equal to_____(2008)

A. 4 B. 2 C. 1 D. -2

105. *what is the gretest lower bounde of the sequence* $\left\{(-1)^n \frac{1}{n+1}\right\}_{n=0}^{\infty}$?

A. -1 B. 0 C. $-\frac{1}{2}$ $D.\frac{1}{2}$

106. What is the limit of the sequence 1, $\frac{2}{2^2-1^2}, \frac{3}{3^2-2^2}, \frac{4}{4^2-3^2}, \ldots$?

A. 0 B. 1 C. $\frac{1}{2}$ $D.\frac{3}{2}$

107. What is the value of left-hand side limit, $\lim_{x\to 0^-} \frac{\sin x}{x^2}\sqrt{4x^3+b9x^2}$?

A. -3 $B.3$ $C.2$ $D.$ *does not exist*

108. What is the value of $\lim_{x\to 2} \frac{x^3-8}{x^2-4}$?

A. 2 B. 3 C. -2 D. The limit dose not exit

109. *what is the value of* $\lim_{n\to\infty} \left(\frac{3^n+2^n}{6^n}\right)^n$

A. 1 $B.0$ $C.\infty$ $D.\frac{5}{6}$

CHAPTER 3

110. If $f(x) = \frac{x^2}{1+xg(x)}$, g(2) = 1 and g'(2) = 10, then which one of the following is equal to $f'(2)$?

A. -8 B. $\frac{-8}{9}$ C. $\frac{3}{4}$ D. $\frac{8}{9}$

111. A business association gets a net profit of Birr 3,000 at the end of each month. Just after the fifth year, its amount was Birr 230.000. What was the starting amount of the business?

A. Birr 47,000 B. Birr 50,000 C. Birr 53,000 D. Birr 56,000

112. If $f'(x) = -(2e^{-2x} + \sin x)$ and $f(0) = 5$, then $f(x)$ is equal to:

A. $e^{-2x} + \cos x + 5$ C. $3 - e^{-2x} - \sin x$

B. $5 - 2e^{-2x} + \cos x$ D. $e^{-2x} + \cos x + 3$

113. If g(x) $=3^{\pi x}$, $then\ g^{[n]}(0) is\ equal\ to: -$

A/ π^n B/ $(\pi \ell n 3)^n$ C/ $(\ell n 3)^n$ D/ $\pi(\ell n 3)^n$

114. If $f(2) = -3$, $f'(2) = 4$, $g(1) = -5$, $g'(1) = 1$ and $F(x) = f(2x + 2) \cdot g(1-x^2)$, then what is the value of $F'(0)$?

A. 19 B. 0 C. -20 D. -40

115. Suppose that a function f has the property that $f(x+y) = f(x) \cdot f(y)$ for all values of x and y and that $f(0) = 2$, $f'(0) = 1$. Then which one of the following represents the formula for the derivative $f'(x)$?

A. $f'(x) = 2f'(x) + 1$ C. $f'(x) = f(x) + 2$

B. $f'(x) = f(x) + 2f'(x)$ D. $f'(x) = 2f(x) - 1$

116. If f(x) = $\ell n\left(\sqrt{x^2+1}\right)$, which of the following is equal to $f'(x)$?

A. $\frac{x}{\sqrt{x^2+1}}$ B. $\frac{2x}{\sqrt{x^2+1}}$ C. $\frac{x}{x^2+1}$ D. $\frac{2x}{x^2+1}$

117. For what values of a and b is the function

$$f(x) = \begin{cases} 1 - 3x^2, for\ x \le 1 \\ ax + b, for\ x > 1 \end{cases}$$ differentiable at $x = 1$?

A. $a = 6, b = 0$ C. $a = 0, b = -2$

B. $a = -3, b = 1$ D. $a = -6, b = 4$

118. Let $f(x) = e^{2x} + sin^2 x, then\ f''(x) =$_____

A. $2e^{2x} + 2\ sinx\ cosx$ C. $2e^{2x} - \sin(2x)$

B. $4e^{2x} + \sin(2x)$ D. $4e^{2x} + 2\cos(2x)$

119. If $f(x) = sin\left(\frac{\pi}{x^2}\right), then f'\left(\frac{1}{2}\right)$ is:

A/ 1 B/ 0 C/ -16 D/ -1/4

120. If h(x)=e^{xsinx}, then what is the value of $h''(0)$?

A/ 0 B/ 1 C/ 2 D/ 3

121. If f(2)= -3, $f'(2) = 4, g(0) = 5, g'(0) = 1 and\ F(x) = f(x+1).g(1-x^2)$, then the value of $F'(1) is$:

A/ 20 B/ 14 C/ -22 D/ 26

122. Let G(x)=f(x^3+1). If $f'(0) = 1 = f''(0)$, then $G''(-1) =$_____

A/ 3 B/ 9 C/ 6 D/ 15

123. If $f(x) = \cos(x - \sin(2x)), then\ f'(x) =$_____

A. cos(x-cos (2x)) + 2 sin (2x)cos(x-cos(2x)) C. - sin (x- sin (2x))

B. 2cos (2x) sin(x- sin (2x))-sin (x-sin(2x)) D. -sin (1-2cos(2x))

124. Let $f'(x) = xe^{3x}$ and f (0)= 1, then f(x) is equal to:

A/ $x + e^{3x} + \frac{2}{3}$ B/ $e^{3x} + 2$ C/ $3xe^{3x} + 1$ D/ $\frac{1}{3}(e^{3x} + 2)$

125. At what point does the equation of the line tangent to the graph of

$$f(x) = e^{2x} at\ x = 0, intersect\ the\ line\ y = x?$$

A/ (-1,1) B/ (0,0) C/ (-1/2,0) D/ (2,2)

126. Which of the following statement is true?

A/ If a function is continuous at a, then it differentiable at a.

B/ If a function is not differentiable at some point in its domain then it is not continuous.

C/ If a function is differentiable in its domain, then it is continuous at every point of its domain.

D/ If the derivative of a function at some point is zero, then the function is a constant function.

127. Let f(x)= ℓn (x^2+2x), then $f''(1)$=_____

A/ $\frac{-10}{9}$ B/ $\frac{-1}{9}$ C/ $\frac{-5}{9}$ D/ $\frac{-19}{9}$

128. If f(x)= x^2g(3-x^2), g(2)=3, $g'(2)$= -4, then $f'(-1)$ is equal to

A/ 20 B/ -14 C/ -7 D/ -4

129. The weight w of a person in kilograms and the person's height h in meters are related by the equation $\ln(10w) = 4.6 + 3lnh$. if ln2=0.6, ln3= 1.1 and ln5 = 1.6, then what is the height of a person whose weight is 60kg?

A. 1m B. $e^{\frac{1}{3}}m$ C.$\sqrt{e}\,m$ D.2m

130. For $f(x) = x^2\sqrt{2x + 12}$, what is the equation of the tangent line to the graph of f at x =2 ?

A. Y- 4 = 16(x-2) C. y = $\frac{1}{\sqrt{12}}(x - 2) - 16$

B. Y= 17(x-2)+16 D. y= 8(x-2) +32

131. If F(x)=f(2x+2).g($1 - x^2$), with f(2)=-3, f '(2)=4, g(1)= -5, and g'(1)= 1, then what is the actual value of F'(0)?

A. -40 B. -20 C. 0 D.19

132. If $f(x) = e^{2x}sinx$, then $f''(x)$ is equal to:

A. $3e^{2x}sinx - 4e^{2x}cosx$ C. $e^{2x}(3sinx + 4cosx)$

B. $4e^{2x}sinx + 2e^{2x}cosx$ D. $e^{2x}(4sinx - 3cosx)$

133. If $y = \sin(3x^2)$, then the simplified form of $\frac{d^2y}{dx^2}$ is:

A. $-6\sin(3x^2)$ C. $6\cos(3x^2) - 36x^2\sin(3x^2)$

B. $\cos(6x) - 6\sin(3x^2)$ D. $x^2\cos(3x^2) + 6\sin(3x^2)$

134. If $f(x) = \pi^2$, then f '(1) is equal to:

A. 2π B. π^2 C. 1 D.0

135. Let $f(x) = \frac{6x}{x+a}$, for what value of a is f '(a)=1?

A. $\frac{1}{3}$ B. $\frac{2}{3}$ C. $\frac{3}{2}$ D.3

136. If f(x)= $e^{2x} + x - 3cosx$,then what is f''(x)?

A. $e^{2x} + 1 - 3sinx$ C. $4e^{2x} - 3cosx$

B. $e^{2x} + 1 + 3sinx$ D. $4e^{2x} + 3cosx$

137. If $g(x) = xf(x) - \sqrt{f(x)}\ and\ f(2) = f'(2) = 4$, then which of the following is equal to $g'(2)$?

A. 11 B.8 C. 2 D.0

138. Let $f(x) = \begin{cases} 3x - 1, x \le 2 \\ x + 3,\ x > 2 \end{cases}$ which of the following is true?

A. f'(2)=1 B. f'(2)=3 C. f'(2)=5 D. f has no derivative at 2

139. If f(x) = xe^{3x}, then which one of the following is equal to f''(x)?

A.$(1 + 3x)e^{3x}$ C. $(3 + 9x)e^{3x}$

B. $(6 + 3x)e^{3x}$ D. $(6 + 9x)e^{3x}$

140. If $f(x) = x^3, then\ \lim_{h\to 0} \frac{f(h+2)-f(2)}{h}$ is equal to

A. 4 B. -4 C. 12 D. ∞

141. Let $h(x) = x + 3^x\ and\ F(x) = (foh)(x) such\ that\ f'(4) = -1$. Then , $F'(1)$ is equal to:

A.$1 + 3ln3$ B.$-1 - 3ln3$ C. $4 + 12ln3$ D. $-4 - 12ln3$

142. Which of the following is the equation of the line tangent to the graph of $f(x) = \begin{cases} x - \pi, & x \le 0 \\ 1 - 2sinx, & x > 0 \end{cases}$ at $(\pi, f(\pi))$?

A. $y = 2x - 2\pi + 1$ C. $y = -2x + 2\pi + 1$

B. $y = 2x - 2\pi - 1$ D. $y = -2x + 2\pi - 1$

143. If $f(x) = \ln(2 + secx)$, then $f'(x)$ is equal to:

A. $\frac{tanx}{2+secx}$ B. $\frac{tanx}{2+cosx}$ C. $\frac{tanx}{1+2cosx}$ D. $\frac{cosx}{1+2cosx}$

144. The equation of the line tangent to the graph of $f(x) = \frac{2x}{x-3}\ at\ x = -1\ is$

A. 8y – 3x+1=0 C.8y +3x- 1 =0

B. 3y – 8x + 1=0 D.3y+8x – 1=0

145. What is the simplified form of the derivative of $f(x) = \frac{sinx}{1+cosx}$?

A. $1 + secx$ B. $\frac{1}{1+cosx}$ C. $\frac{cosx}{(1+cos)^2}$ D. $tanx + cotx$

146. Which of the following is the equation of the tangent line to the graph of $f(x) = \frac{3x}{x-1}\ at\ (2, f(2))$?

A. $3y + x = 20$ B. $3y - x = 16$ C. $y - 3x = 0$ D. $y + 3x = 12$

147. Let $f(x) = cosx + 5^x$, then, what is $f'(x)$?

A. $sinx + 5^x ln5$ C.$-sinx + 5^x ln5$

B. $-sinx + 5^x log5$ D. $sinx + 5^x log5$

148. If $g(x) = xf(3x + 1), f(4) = 1\ and\ f'(4) = 2, then\ g'(1)$ is equal to:

A. 7 B. 6 C. 4 D.3

149. Which of the following is the second derivative of $f(x) = \ln(x^2 + 1)$?

A. $\frac{1-2x^2}{x^2+1}$ B. $\frac{-2(x^2-1)}{x^2+1}$ C. $\frac{-2(x^2-1)}{(x^2+1)^2}$ D. $\frac{2-4x^2)}{(x^2+1)^2}$

150. Let $f(x) = g(\sqrt{4x+1}).$ *if* $g'(3) = \frac{1}{2}$, *then* $f'(2)$ is equal to:

A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{1}{2}\sqrt{5}$ D. $\frac{1}{2}\sqrt{13}$

151. If $f(x) = x^5 + 2x, then\ \lim_{h\to 0} \frac{f(h+1)-f(1)}{h}$ is equal to

A. 2 B. 7 C. 5 D. ∞

152. Let $f(x) = e^{3x-1}$ and g(x)= tanx. If $F(x) = xf(x) + f(g(x))$, which of the following is equal to $F'(0)$?

A. $3e^{-1}$ B. $4e^{-1}$ C. $\frac{1}{e}(1+\frac{1}{e})$ D. $\frac{1}{e}(1+\frac{3}{e})$

153. If $f(x) = 2x^5 - 3x, then\ \lim_{x\to 1} \frac{f(x)-f(1)}{x-1}$ *is equal to*_____(2008)

A. 1 B. -1 C. 7 D. ∞

154. If $f(x) = e^{3x}cosx - \frac{x+\pi}{x^2+2}$, *then* $f'(0)$ *is equal to*_____(2008)

A. $3 - \frac{\pi}{2}$ B. $\frac{3}{2}$ C. $\frac{7}{4}$ D. $\frac{5}{2}$

155. If $f(x) = ln(\sqrt{x^2-5})$, which one of the following is equal to $f'(x)$? (2008)

A. $\frac{x}{x^2-5}$ B. $\frac{-x}{\sqrt{x^2-5}}$ C. $\frac{2x}{\sqrt{x^2-5}}$ D. $\frac{-x}{x^2-5}$

156. $\frac{d}{dx}(lne^{2x})$ *is equal to*: (2008)

A. $\frac{1}{e^{2x}}$ B. $\frac{2}{e^{2x}}$ C. 2x D. 2

157. If $f(x) = 2 + |x-3|$ *for all* x, then the value of the derivative $f'(x)$ *at* $x = 3$ *is*_____ (2008)

A. -1 B. 1 C. 2 D. does not exist

158. If $f(x) = \ln(tanx)$, *then* $f'(x)$ *is equal to*: **(2008)**

A. $\frac{\sin x}{cos^2 x}$ B. $\frac{1}{sinxcosx}$ C. $\frac{1}{\sin^2 x}$ D. $\frac{1}{cos^2 x}$

159. Which one of the following is the equation of the tangent line to the graph of $f(x) = \frac{4}{x^2} - 2x + 4$ at (2, f(2))? **(2008)**

A. $3x + y = 6$ C. $6x + y = 13$

B. $3x + y = 7$ D. $-6x + y = 13$

160. If $y = cos^2 3x, then\ \frac{dy}{dx} =$ _____(2008)

A. $-6cos3xsin3x$ C. $6cos3x$

B. $-2cos3x$ D. $2sin3xcos3x$

161. If $f(x) = xe^x, g(x) = lnx$ *and* $h(x) = fog(x), then\ h''(x)$ *is equal to*: (2008)

A. $\frac{3-2lnx}{x}$ C. $\frac{e^{-x}-3lnx}{x^3}$

B. $\frac{e^{-x}+3lnx}{x^2}$ D. $\frac{-3+2lnx}{x^3}$

162. *If* $f(x) = ln(2^{tanx})$, then what is the value of $f`(0)$?

A. ln2 B. -2ln2 C. $\frac{ln2}{2}$ $D.\ 1$

163. If $h(x) = \sqrt{1+\sqrt{x}}$, then which of the following is equal to $h`(x)$?

A. $\frac{1}{2\sqrt{1+\sqrt{x}}}$ c. $\frac{x}{2\sqrt{1+\sqrt{x}}}$

B. $\frac{1}{4\sqrt{x+x\sqrt{x}}}$ d. $\frac{x}{4\sqrt{x+x\sqrt{x}}}$

164. *If* $f(x) = \frac{1}{x}$, *then what is the value* $f^{(n)}$ (x)?

A. $f^{(n)}(x) = \frac{(-1)n!}{x^n}$ C. $f^{(n)}(x) = \frac{(-1)^n n!}{x^{n-1}}$

B. $f^{(n)}(x) = \frac{(-1)^{n+1}(n+1)!}{x^{n+1}}$ D. $f^{(n)}(x) = \frac{(-1)^n n!}{x^{n+1}}$

165. *If* $f(x) = x^3 - 2x + 1$, *then which one of the following is NOT true*?

A. $f(c) = 0$ *for some* $c \in [-2,0)$.

B. $f(c) = \frac{1}{2}$ *for some* $c \in [0,1]$.

C. $f(c) = \frac{1}{4}$ *for some* $c \in [-1,0]$.

D. $f(c) = 3$ *for some* $c \in [1,2]$.

166. *Let* $f(x)$=2e^x–ksinx + 1. If the equation of the tangent line to the graph of f at (0,3) is y = 5x+3. then what is the value of f?

A. 3 B. -3 $C. -5$ $D. 2$

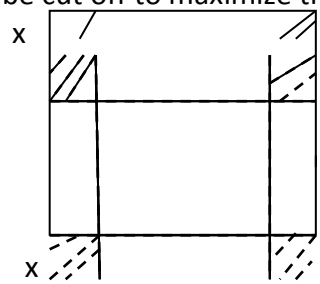
167. *what is the value of* $\lim_{n\to\infty} \frac{8\left(\frac{1}{2}+h\right)^2 - 8\left(\frac{1}{2}\right)^2}{h}$?

A. 0 B. 4 C. 8 D. The limit dose not exit

CHAPTER 4

168. Suppose that equal squares are cut from each of the four corners of a square cardboard whose sides are 72 cm long.[see the figure below.] the resulting flaps are then folded up to from a box without a top. How long should be each of the four squares that has to be cut off to maximize the volume of the box?

A. 6cm
B. 12cm
C. 15cm
D. 24cm



169. Let *f*(x) = x^4 – 6x^2 +1 on [-2,3], which of the *following* is a local maximum value of f.

A.1 B. -8 C. 28 D. -7

170. On which of the *following* intervals does the graph of $f(x) = \frac{x}{x^2+4}$ increasing?

A. (-∞, 2] B. [-2, 2] C. [2, ∞] D. (-∞,∞)

171. Which one of the following is true about $f(x) = xe^{-x}$

A. f has a local min at x = 1
B. The graph of f is concave down ward on (-∞, 2]
C. f is strictly increasing on [1,∞)
D. (2, f (2)) is not an inflection point of the graph of $f(x)$

172. Let f (x) = 4 x^3 – 6 x^2– 9x on (-∞,∞). Which one of the *following* is NOT true?

A. f has local maximum at $\left(-\frac{1}{2}, {}^{5}/_{2}\right)$ C. $\left(\frac{1}{2}, \frac{-11}{2}\right)$is the inflection point

B. f is concave upward on $[\frac{1}{2}, \infty)$ D. f is strictly increasing on $\left[\frac{-1}{2}, \frac{3}{2}\right]$

173. On which of the *following* interval is $f(x) = x^4 - 2x^2 + 10$ strictly decreasing?

A. (-∞,0) B. (-1, 0) C. [0, 1] D. [1, ∞)

174. .On which of the *following* interval is $f(x) = \ell n(x^2 + 1)$ concave downward.

A. (-∞,-1] ∪ [1, -∞) B. [0 , ∞) C. (-∞,0] D. [-1 , 1]

175. Which of the *following* is a local minimum point of the graph of f (x) = $-3x^4 + 4x^3 + 12x^2 + 1$

A. (-2 , -33) B. (-1 , 4) C. 0 , 1) D. (2, 33)

176. Let f (x) = $x^4 - \frac{16}{3}x^3 + 6x^2$ for all $x \in (-\infty, \infty)$. what is the range of f(x) .

A. (- ∞, ∞) B. [0, ∞) C. [-9, ∞) D. ($\frac{5}{3}$, -9]

177. Which of the following is the set of all critical numbers of the function $f(x) = x + \frac{1}{x}$

A. {-1, 0, 1} B.{-1,1} C.{1} D. {-1,0}

178. Let f(x) = x|x|, for all x in $(-\infty, \infty)$. Which of the following is true

A. f is not differentiable at x=0 C. f is differentiable only on $(0, \infty)$

B. f'(x) = 2|x|at each x in$(-\infty, \infty)$ D. f'(x) = 2x at each x in $(-\infty, \infty)$

179. Let $f(x) = 2x|x|$, for all x in $(-\infty, \infty)$.Then which of the following is true?

A. f has a minimum value at x=0 C. f is decreasing on $(-\infty, 0)$

B. f is not differentiable at 0 D. f'(0)= 0

180. Suppose f is defined on [0,1] and f' exist on (0,1). Then which of the following is always true

A. if f'(x)>0 for every x in (0, 1),then f has absolute minimum at x=0

B. if f'(x)<0 for every x in (0,1),then f is increasing

C. if f'(x)<0 for every x in (0,1),then f is decreasing

D. if f'(x)=0, then there exist c in (0,1) such that f'(0)= f'(1)

181. which one of the following is the maximum value of the function $f(x) = e^{-|x|}$

A. -2 B. 0 C. -5 D. 1

182. let y = $|x^2 + 2x + 1|$, then what is $\frac{dy}{dx}$

A.|2x+2| B.-|2x+2| C.2x+2 D. -2x – 2

183. Let function f is such that $f(-x) = f(x)$ and differentiable for all x. which one of the following must be true?

A. $f'(-x) = \frac{1}{f'(x)}$ C. $f'(-x) = -f'(x)$

B. $f'(-x) = f'(x)$ D. $f'(-x) = \frac{-1}{f'(x)}$

184. Let $f(x) = x|x|$, for all x in $(-\infty, \infty)$. Which of the following is true

A. f is not differentiable at x=0 C. f is differentiable only on $(0, \infty)$

B. f'(x) = 2|x|at each x in$(-\infty, \infty)$ D. f'(x) =2x at eachx in $(-\infty, \infty)$

185. Which of the following is not true about $f(x) = \frac{x}{4+x^2}$ on [-4,4]

A. it is increasing on [-2,2] C. Its critical numbers are -2 and 2

B. Its absolute maximum value is ¼ D. Its absolute minimum value is - ¼

186. let $f(x) = \frac{1}{3}x^3 - \frac{3}{2}x^2 - 4x + 3$. Then which of the following is true?

A. f(x) is increasing on [-1,4] C. f(x) is increasing on [4, ∞]

B.f(x) has local minimum at 4 D. f(x) has no local maximum

187. If we want to construct a cylindrical can with a bottom but no top that will have a volume of $16\pi cm^3$. What is the radius of the can in meter that will minimize the amount of material needed to construct the can?

A. 4cm B. 2cm C.3cm D.1cm

188. The volume of a right circular cylinder is $5m^3$.how long should be the length of the radius of the base of the cylinder that gives the minimum surface area in meter?

A. $\sqrt[3]{\frac{5}{\pi}}$ B. $\sqrt[3]{\frac{25}{\pi}}$ C. $\sqrt[3]{\frac{1}{5\pi}}$ D. $\sqrt[3]{\frac{5}{2\pi}}$

189. The combined perimeter of a circle and a square is 16cm. What is the radius of the circle produce a minimum total area?

A. $\frac{16}{4+\pi}$ B. $\frac{4}{1+\pi}$ C. $\frac{4}{\pi+4}$ D. $\frac{8}{4+\pi}$

190. Which of the following is not true about the function defined by $f(x) = x^{1/3}$?

A. Its graph is concave upward on $(-\infty, 0)$ C. Its graph is concave upward on $(-\infty, 0)$

B. The inflection point of f *is* $(0,0)$ D. It has an extreme value at x = 0

191. Let $f(x) = x^2 - 6x$ and ℓ be a line tangent to the graph of f at c in $(0,4)$. what is the value of c for which ℓ is parallel to the chord of f whose end points are $(0,0)$ and $(4,-8)$?

A. 4 B. 1 C. 2 D. 3

192. Which of the following is <u>not true</u> about $f(x) = xe^{-x}$?

A/ f is strictly increasing on (-∞,1] C/ (2,f(2)) is an inflection point of the graph of f.

B/ The graph of f is concave up ward on (2, ∞) D/ $\left(1, \frac{1}{e}\right)$ is local minimum point of f.

193. An object is moving along the parabola y = $\sqrt{2x}$ in *xy* – plane. At what point on its path does the object becomes closest to the point(2,0)?

A. $(3, \sqrt{6})$ B. (1,1) C. $(1, \sqrt{2})$ D. (2, 2)

194. Which one of the following is necessarily true?

A. If $f'(x) = 0$ for all x in an interval I, then $f(x) = 0$ for all x in I.

B. If $f(x) = x^2 \sin x + 5$, then there is $C \in (0, \pi)$ such that $f'(x) = 0$

C. If $f(x) = e^x + x^2$ is increasing on (-∞, ∞)

D. If $f'(C) = 0$, then f attains its maximum of minimum value at $x = C$

195. What is the absolute maximum value of $f(x) = 2x^2 - x^4 - 4$ on [0, 2]?

A. -3 B. 3 C. -4 D. 12

196. A ladder 6m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate (speed) of $\frac{1}{2}$m/sec, how fast is the angle between the top of the ladder and the wall changing when the angle is $\frac{\pi}{4}$ rad?

A. $\frac{\sqrt{2}}{12}$ rad/sec B. $\frac{\sqrt{2}}{2}$ rad/sec C. $\frac{\sqrt{2}}{6}$ rad/sec D. $\frac{\sqrt{2}}{3}$ rad/sec

197. The number of shoes *S* that a factory can produce per day is a function of the number of hours r it operates: $S(t) = 40^t$ for $0 \le t \le 12$. The daily cost *C*, in Birr, to manufacture *s* shoes is given by the function $C(s) = 0.1s^2 + 90s + 800$. If the factory operates for 10 hours, what is the cost it incurs in producing as much shoes it can within this time?

A. Birr 400 B. Birr 1.600 C. Birr 52,800 D. Birr 124,600

198. A company manufactures x computer sets per month. The monthly marginal profit (in Birr) is given by: $p'(x) = 165 - 0.1x$, for $0 \le x \le 400$.

The company is currently manufacturing 10 sets of computers per month, but is planning to increase production. What is the total change in the monthly profit if the monthly production is increased to 60sets?

A. Birr 500. B. Birr 1,865. C. Birr 8,075. D. Birr 18.635.

199. The total cost (in Birr) of producing x radio sets per day is given by the expression

$\frac{1}{4}x^2 + 35x + 25$ and the price per set at which they may be sold is given by 50 - $\frac{1}{2}x$. What should be the daily output to obtain a maximum total profit?

A. 50 sets per day B.23 sets per day C. 10 sets per day D. 7 sets per day

200. Let f(x) = $\begin{cases} 3 - e^{2x, if\ x<0.5} \\ \frac{2^x - 5}{x+1}, if\ x \ge 0.5 \end{cases}$. if c is a zero of f, that is, $f(c) = 0$, then which one of the following intervals must contain c?

A. (-∞ , 0] B. [0 , 1] C. [1, 2] D. [2, 3]

201. Which of the following is **Not true** about f(x) = 10 - x^3+ 3x?

A/ The maximum value of f in[0,∞) $is 12$. C/ f has local minimum value at x=1.

B/ f is decreasing is $(-\infty, -1) \cup (1, \infty)$. D/ (0,0) is the inflection point of the graph of f.

202. The sum of a number and twice another is 200. What are the numbers if their product is as large as possible?

A/ 120,40 B/ 90,55 C/ 100,50 D/ 80,60

203. Let $f(x) = e^{-|x|}$. Which one of the following is not true about f ?

A. Its maximum value is 1 C. Its minimum value is 0

B. f is increasing on (-∞,0] D. f is decreasing on $[0, \infty)$

204. A box is to have a square base, an open top, and volume of 32 m^3. What is the length of the side of the base of the box that use the least amount of material?

A. 2m B. 1m C. 8m D. 4m

205. The radius r of a right circular is increasing at a rate of 3cm/min. The height h of the one is related to the radius by h = 3r. What is the rate of change of the volume when r = 2cm?

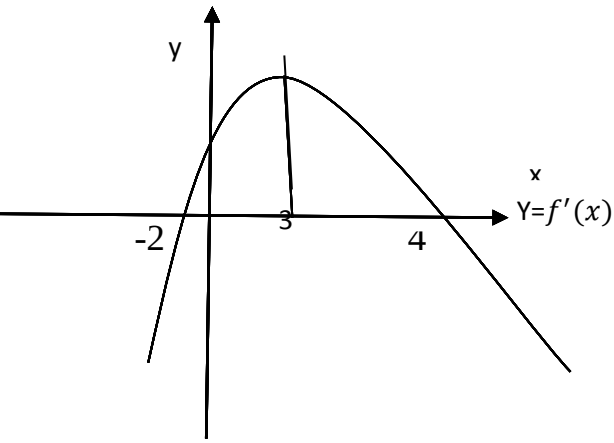
A. $54\pi cm^3$/min B. $36\pi cm^3$/min C. $18\pi cm^3$/min D. $81\pi cm^3$/min

206. The total cost for ordering and storing x computers are given by

$c(x) = 2x - \frac{20{,}000}{x}$ birr. How many computers must be ordered to produce a minimum cost?

A/ 1000 B/ 50 C/ 100 D/ 200

207. Suppose f(x) is differentiable at all $x \in (-\infty, \infty)$ and the graph of y=$f'(x)$ is given as shown in the figure below. Which of the following is true?



A/ f(x) is increasing (-∞,3]

B/ (-2,f(-2)) is local maximum point

C/ f(x) is decreasing in [-2,4]

D. f(x) is decreasing in $(-\infty, -2) \cup (4, \infty)$.

208. Which of the following is the set of critical number(s) of f(x)=/x^2-1/?

A/ {0} B/ {0,1} C/ {1,-1} D/ {-1,0,1}

209. If $f(x) = x^3 - 3x + 2$, then which of the following statements is true?

A/ The local minimum point of f is (-1,0)

B/ The local maximum point of f is (1,4)

C/ 1 is the local minimum value of f.

D/ 4 is the local maximum value of f.

210. An open box that has a square base and a surface area of 48 sq. units is manufactured. What dimensions will produce a box with a maximum volume?

A. x= 2 and h= 4 C. x=4 and h = 4

B. x=4 and h=2 D/ x=2 and h=8

211. Let $f(x) = 2x^2 + 6$, then the value(s) of C in (1,4) for which f(c)= 24 is:

A . -3 B/ $\sqrt{15}$ C/ 3 D/ ± 3

212. A farmer sited Birr 2000 in a bank that pays 4% simple interest per annum. In how many years will his/her amount be doubled?

A/ 2 B/ 24 C/ 25 D/ 3

213. What are the points of $f(x) = x^2 + 1$ closest to the point (0,2)?

A/ $(0,1) and \left({}^1/_2, {}^3/_4\right)$ B/ $\left(\frac{\sqrt{2}}{2}, \frac{3}{2}\right)$ and $\left(\frac{-1}{\sqrt{2}}, \frac{3}{2}\right)$

C/ $\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{3}}{2}\right) and \left(\frac{-\sqrt{2}}{2}, \frac{\sqrt{3}}{2}\right)$ D/ $\left(\frac{\sqrt{2}}{2}, \frac{3}{4}\right) and \left(\frac{-\sqrt{2}}{2}, \frac{3}{4}\right)$

214. A man bought a motor car for Birr 10,000. If the value of the car depreciates at the rate of Birr 500 per year. What is its value at the end of the 8th year (in Birr)?

A/ 14,000 B/ 6,500 C/ 6000 D/ 13,500

215. Which one of the following is the minimum value of f(x)= 2x-x^2 on the interval [-1,3]?

A/ -3 b/ -4 C/ 1 D/ It do not have minimum value

216. A rectangular play ground has length 5 meters more than its width. If 1 meter is added to each side of the rectangle, the area is increased by 154 square meters. What is the length of the original ground?

A. 79m B. 77m C. 74m D. 72m

217. The total cost for ordering and storing x units is given by $C(x) = 3x + \frac{30{,}000}{x}$ birr. How many units must be ordered to produce a minimum cost?

A. 50 B. 100 C. 300 D. 1000

218. Which one of the following is the set of all critical numbers of $f(x) = \frac{1}{3}x^3 - |4x - 1|$?

A. $\{\frac{1}{4}, 2\}$ B.$\{-2, \frac{1}{4}, 2\}$ C. {-2, 2} D. $\{\frac{1}{4}\}$

219. On which one of the following intervals does $f(x) = x^4 + 4x$ increase?

A. (-∞ , -1] B. (-∞ , 0] C. [-1, ∞) D. (-∞ , ∞)

220. The weight w of a person in kilograms and the person's height h in meters are related by the equation $\ln(10w) = 4.6 + 3lnh$. if ln2=0.6, ln3= 1.1 and ln5 = 1.6, then what is the height of a person whose weight is 60kg?

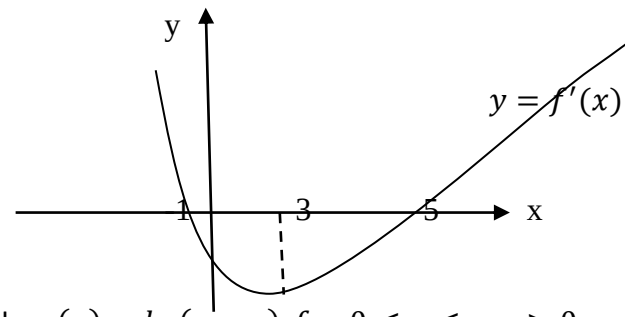
A. 1m B. $e^{\frac{1}{3}}m$ C.$\sqrt{e}\,m$ D.2m

221. On which of the following interval is $f(x) = x^4 - 2x^2 + 10$ strictly decreasing?

A. $(-\infty, 0)$ B.(-1,0) C. (0, 1) D. (1, ∞)

222. Suppose f(x) is differentiable at all x$x \in (-\infty, \infty)$ and the graph of $y = f'(x)$ is as shown in the figure below. Which of the following is true?

A. f(x) increases on [3, ∞).
B. f(x) attains its minimum value at x=3.
C. f(x) decreases on [-1,5].
D. f(x) attains its maximum value at x=5.



223. The rate of certain chemical reaction is given by $r(x) = kx(a - x), for\ 0 \le x \le a, a > 0\ and\ k > 0$. for what value of x does the rate of reaction increase?

A. $0 \le x \le \frac{a}{2}$ C. $-\infty \le x \le \frac{a}{2}$

B. $\frac{a}{2} \le x \le a$ D. $\frac{a}{2} \le x \le \frac{3a}{4}$

224. The two positive integers whose sum is 18 and the sum of whose squares is the minimum are:

A. 8 ; 10 B. 7 ; 11 C. 5 ; 13 D. none of the above

225. Two real numbers whose difference is 18 and whose product is the minimum are?

A. 9 & 9 B. 1& 17 C. 9 & -9 D. 2 & 16

226. A closed cylindrical can is to be made to hold 1000cm^3 of oil. What are the dimension (radius r and height h) that will minimize the total surface area of the can?(2008)

A. $\boldsymbol{r = \frac{\sqrt[3]{50}}{\pi}, h = 2\frac{\sqrt[3]{50}}{\pi}}$ **C.** $\boldsymbol{r = \sqrt[3]{\frac{50}{\pi}}, h = 2\sqrt[3]{\frac{50}{\pi}}}$

B. $\boldsymbol{r = \frac{\sqrt[3]{500}}{\pi}, h = 2\frac{\sqrt[3]{500}}{\pi}}$ **D .** $\boldsymbol{r = \sqrt[3]{\frac{500}{\pi}}, h = 2\sqrt[3]{\frac{500}{\pi}}}$

227. Let f be twice differentiable function on $\mathfrak{R}$, Which one of the following is necessarily true? (2008)

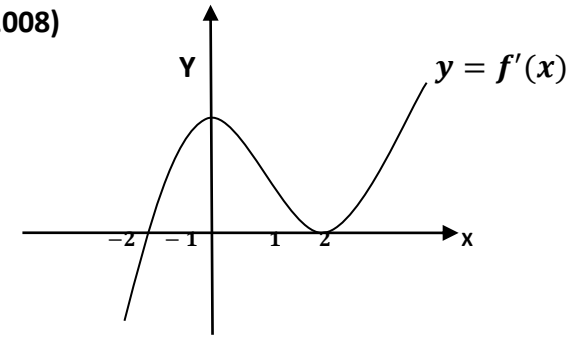
A. If $f'(c) = 0, at\ some\ c \mathcal{E} \mathfrak{R}$, then f has a relative extreme value at x=c.

B. If $f'(x)$ is increasing , then the graph of y = f(x) is concave upward.

C. If $f'(x) = 0, for\ all\ x \mathcal{E} \mathfrak{R}$, then f(x) = 0 for all $x \mathcal{E} \mathfrak{R}$

D. $If\ f(x) is\ icreasing\ , then\ f''(x) \ge 0 for\ all\ x \mathcal{E} \mathfrak{R}$.

228. Suppose $f(x)$is differentiable on $(-\infty, \infty)$ and the graph of its derivative $y = f'(x)$ is as shown in the following figure. (2008)



Which one of the following is true about $f(x)$?

A. $f(x)$ is increasing on $(-\infty, 0) \cup (2, \infty)$.

B. $f(x)$ has local extreme value at $x = 2$.

C. $f(x)$ has local minimum value at $x = -2$.

D. $f(x)$ has local maximum value at $x = 0$.

229. Which one of the following is true about the function f defined by $f(x) = x^2 + e^{2x}$? (2008)

A. f is decreasing for $x \geq 0$

B. f is increasing for $x \geq 0$

C. f has a relative minimum at $x = 0$

D. f has a relative maximum at $x = 0$

230. The graph of $y = 5x^4 - x^5$ has a point of inflection at: (2008)

A. (3, 162) only

B. (4, 256) only

C. (0, 0) and (3, 162)

D. (0, 0) only

231. An object is moving along the parabola $y = 2\sqrt{x}$ in xy-plane. At what point on its path does the object becomes closest to the point (5,0)?(2008)

A. (4, 4) **B. (1, 2)** **C. (3, $\sqrt{6}$)** **D. (3, $2\sqrt{3}$)**

232. What is the absolute minimum value of $f(x) = x^4 - 2x + 4$ on the interval $[0, 2]$? (2008)

A. -4 B. -3 C. 3 D. 4

233. Consider all right circular cylinders for which the sum of the height and circumference is 30cm. what is the radius of the one with maximum volume? **(2008)**

A. 20cm B. 10cm C. $\frac{30}{\pi^2} cm$ D. $\frac{10}{\pi} cm$

234. Let $f(x) = \begin{cases} e^{2x} - x - 2, if\ x < 2 \\ sin4x - 2,\ if\ x \geq 2 \end{cases}$ if c is the zero of f, that is, f(c) = 0, then which of the following intervals must contain c? **(2008)**

A. (1, 3) B. (2, 3) C. (-2, -1) D. (-∞, −2)

235. If air is pumped into a spherical balloon at the rate of $32\pi\ cm^3/sec$, then how fast does the radius of the sphere increase at the moment when the radius is 4cm? **(2008)**

A. 3/2cm/sec B. 2/3cm/sec C. 2cm/sec D. 1/2cm/sec

236. *which one of the following is the set of critical numbers of* $f(x) = \frac{3}{8}\ x^{8/3} - 6x^{2/3}$?

A. $\{-2,2\}$ B. $\{-1,1\}$ C. $\{-1,0,1\}$ D. $\{-2,0,2\}$

237. If $f(x) = ax^3 + \frac{b}{x} + 5$ has local minimum at $(2,-3)$, *what are the value of* a *and* b?

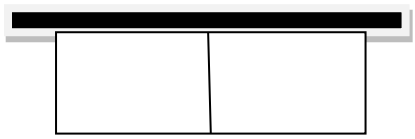
A. $a = -\frac{1}{4}, b = 12$ C. $a = \frac{1}{4}, b = 12$

B. $a = -\frac{1}{4}, b = -12$ D. $a = \frac{1}{4}, b = -12$

238. At what value of x dose the function $f(x) = \frac{4x^3}{3} - x^4$ attains its maximum value?

A. -1 $B.0$ $C.1$ $D.\frac{4}{3}$

239. A man wants to fence two identical rectangular enclosures in a field alongside a straight river as shown as shown in the following figure.



What is the maximum area of each enclosure that he can make with 192 meter fencing material if the side along the river does not need a fence?

A. 1530 m^2 B. 1564m^2 C. 1664m^2 D. 1536m^2

240. A water tank is a rectangular parallelepiped with base length 3m,width 2m and height 2.5 m. If water is flowing in to the tank at the rate of 0.12 m^3/sec, then how fast does the level of water rise up in the tank?

A. 0.02 m/sec C. 0.04 m/sec

B. 0.03m/sec D. 0.06 m/sec

241.

CHAPTER 5

242. If $\int_0^1 \frac{dx}{x^2+1} = \frac{\pi}{4}$, then what is the value of $\int_0^1 \frac{4+2x^2(x^2+1)}{x^2+1}\, dx$?

A/ $\frac{\pi}{4} + 2$ B/ $\frac{\pi}{4} + \frac{2}{3}$ C/ $\pi + \frac{4}{3}$ D/ $\pi + \frac{2}{3}$

243. Which of the following is equal to $\int x^2 \sin x\, dx$?

A/ 2cos x+2xsinx- x^2cosx +c C/ 2 sinx+2cosx-x^2 sinx+c

B/ 2x sinx - x^2 cosx+c D/ 2x cosx - x^2 sinx+c

244. If $f(x) = \frac{1}{9x^2-16}$, then $\int f(x)dx$ *is equal to*:

A/ $\frac{1}{8}\ell n\left|\frac{3x-4}{3x+4}\right| + c$ B/ $\frac{1}{24}\ell n\left|\frac{3x+4}{3x-4}\right| + c$

C/ $\frac{1}{8}\ell n\left|\frac{3x+4}{3x-4}\right| + c$ D/ $\frac{1}{24}\ell n\left|\frac{3x+4}{3x-4}\right| + c$

245. Which of the following is equal to? $\int \frac{e^{\frac{1}{x^2}}}{x^5} dx$

A/ $\frac{1}{2}e^{\frac{1}{x^2}}$ +c B/ $-\frac{1}{2}e^{\frac{1}{x^2}}$+c C/ $2e^{\frac{1}{x^2}}$ +c D/ $-2e^{\frac{1}{x^2}}$ +c

246. What is the area of the region enclosed by the graph $f(x) = \sin x$ and the x – axis between $x = \frac{-\pi}{2}$ and $x = \frac{3\pi}{2}$ (in sq. units)?

A. 5 B. 4 C. 3 D. 2

247. $\int cos^{-3} xsinxdx\ equls$:

A. $cos^{-2} + c$ B. tan x + c C. $\frac{1+tan^2x}{2} + c$ D. $\frac{sec\ x}{2} + c$

248. $\int \log_2 4x\, dx$ equals:

A. $2x + \frac{[x \ln x - x]}{\ln 2} + c$ B. $\frac{[2x^2 \ln x - x]}{\ln 2} + c$ C. $\frac{x[-1+\ln x]}{\ln 2} + c$ D. $\frac{[2x \ln(2x) - 2x]}{\ln 2} + c$

249. Which of the following is the volume of a solid generated by revolving the region bounded by $f(x) = \frac{1}{x}$, x – axis, x = 1 and x = 2 about the x – axis (in cubic units)?

A. $\frac{3\pi}{2}$ B. $\frac{\pi}{2}$ C. π D. $\pi ln\ 2$

250. $\int \sin x \cos x\, dx\ is\ not\ equal\ to$:

A. $\frac{sin^2x}{2} + c$ B. $\frac{-cos^2x}{2}$+c C. $-\frac{1}{4}\ cos2x + c$ D. Sin x +c

251. Which one of the following is the area of the region enclosed by $f(x) = x$, $y = \frac{1}{x}$ and y = 4 (in square units)?

A. $\frac{64\ ln4 - 255}{32}$ B. $\frac{15 - ln16}{2}$ C. $\frac{3+2ln4}{2}$ D. $\frac{11}{2}$

252. Let *f* be an integrable odd function on [-a ,a] for a ≠0. Then the value of $\int_{-a}^{a} f(x)dx$ is equal to:

A. 1 B. $2\int_0^a f(x)dx$ C. 0 D. 2 *f* (a)

253. Evaluating $\int e^{lnx}dx$ gives:

A. $e^{lnx}(lnx - 1) + c$ B. *xlnx* – *x* + c C. $e^{lnx} + c$ D. $\frac{x^2}{2}$+ c

254. $\int sin^2xdx$ is equal to:

A. *Sin* (2*x*) + c C. $\frac{1}{4}\ [\ 2x - \sin 2x] + c$

B. $\frac{sin^3x+c}{3}$ D. $2sin\ x\cos x\ +$ c

255. $\int_1^{\sqrt{e}} \frac{4}{x}\ dx$ is equal to:

A. 2 B. 1 C. 0 D. $\frac{1}{2}$

256. What is the volume of the solid generated when the region bounded by *y*= *3x* and $y = x^2 + 2$ rotates about the *x*- axis?

A. $\frac{5\pi}{6}$ cubic units B. $\frac{33}{5}\pi$cubic units C. $\frac{22}{15}\pi$cubic units D. $\frac{16}{15}\pi$cubic units

257. Let $f(x) = e^{3x} - sin^2x, then \int f(x)dx =$ _____

A/ $\frac{1}{3}e^{3x} - \frac{1}{2}x - \frac{1}{2}sinx\ cosx + c$ B/ $\frac{1}{2}e^{2x} - \frac{1}{3}x - \frac{1}{3}\sin x \cos x + c$

C/ $\frac{1}{3}e^{3x} - \frac{1}{2}\sin x \cos x + \frac{1}{2}x + c$ D/ $\frac{1}{3}e^{3x} - \frac{1}{2}x + \frac{1}{2}\sin x \cos x + c$

258. Which one of the following is equal to $\int \frac{\ell nx + x^2 e^x}{x} dx$?

A. $\frac{1}{2}\ell n^2 x + e^x(x^2-1) + c$ C. $\frac{1}{2}\ell nx + e^x(x-1) + c$

B. $\frac{1}{2}\ell n^2 x + e^x(x^2-1) + c$ D. $\frac{-1}{x^2}\ell nx + e^x(x^2-1) + c$

259. The derivative of the function $F(x) = \int_{-x}^{x} \frac{1}{1+t} dt$ is:

A. $\frac{2}{1-x^2}$ B. $\ln|1+x|$ C. $\frac{1}{1+x}$ D. $\ln\left|\frac{1+x}{1-x}\right|$

260. If f and g are continuous on $\Re$ and $a, b \in \Re$, which one of the following is necessarily true?

A. If $\int_a^b f(x)dx = \int_a^b g(x)dx$, then $f(x) = g(x)$ for all $x \in [a, b]$

B. If $f'(x) = g'(x)$ for all $x \in [a, b]$, then $\int_a^b f(x)dx = \int_a^b g(x)dx$.

C. If $f(x) \geq 3$ for all $x \in [-2, 2]$, then $\int_{-2}^{2} f(x)dx \geq 12$.

D. $\int_a^b f(x)dx = \int_b^a f(x)dx$.

261. What is the area of the region between the graphs of $y = \sin x$ and x – axis where $0 \leq x \leq 2\pi$?

A. 4 B. 4π C. 2 D. 2π

262. If $f(x) = 2x(x^2+1)^4$, then which of the following is an anti derivative of $f(x)$?

A. $\frac{2x}{5}(x^2+1)^5 + c$ C. $\frac{x}{5}(x^2+1)^5 + 1$

B. $\frac{2}{5}(x^2+1)^5 + c$ D. $\frac{1}{5}(x^2+1)^5 - 1$

263. $\int \left(\frac{x}{1-x}\right)^2 dx =$ _____

A/ $x - \frac{1}{1-x} - 2\ell n|1-x| + c$ B/ $x + \frac{1}{1-x} - 2\ell n|1-x| + c$

C/ $x + \frac{1}{1-x} + 2\ell n|1-x| + c$ D/ $x + \ell n|1-x| + C$

264. The area enclosed by the graph of f(x)= /x/ and the x-axis between the lines x=-2 and x=1 (in sq. units) is:

A/ $\frac{25}{2}$ B/ 3 C/ 2.5 D/ 4

265. What is the volume of the solid of revolution generated when the region enclosed by the curve $y=e^x$, the y-axis and the line y=e rotates about the y-axis (in cubic units)?

A/ $\frac{\pi}{2}(e^2-1)$ B/ $\pi(e-2)$ C/ $\frac{\pi}{e^2}$ D/ $\pi(e^2+2)$

266. Evaluating $\int_1^3 \sqrt{x}\left(1 - \frac{1}{x}\right) dx$ gives:

A. $4\sqrt{3}$ B. $\frac{4}{3}$ C. $\frac{8}{3}$ D. $\frac{2\sqrt{3}}{3}$

267. Let f be a function which is continuous on [-a, a] for any real number $a \neq 0$.Then which one of the following statements is not true?

A/ $\int_{-a}^{a} f(x)dx$ doesn't exist C/ If f is even function, then $\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx$

B/ f(x) is integrable on [-a,a] D/ If f is odd function, then $\int_{-a}^{a} f(x)dx = 0$

268. What is the value of $\int_{-1}^{0} \frac{dx}{x^2+4x+4}$?

A/ -5/6 B/ -1/2 C/ ½ D/ 1/6

269. If $f'(x) = 4x + 3 \; and \; f(2) = -1, then \int f(x)dx =$_____

A/ $2x^2+3x-15+c$ B/ $\frac{2}{3}x^3 + \frac{3}{2}x^2 - 15x + c$

C/ $x^3+x^2-15x+c$ D/ $x^3-x^2+15x+c$

270. $\int_{\ell n2}^{\ell n8} \frac{1}{1+e^{-x}} \, dx \; is \; equal \; to$

A/ $\ell n\left(\frac{1+e^8}{1+e^2}\right)$ B/ $\ell n \, \frac{3}{2}$ C/ $\ell n3$ D/ 6

271. Which of the following is an anti-derivative of the function $f(x) = \frac{x-2}{x-1}$?

A/ 1- ℓn/x-1/ B/ x-ℓn /x-1/ C/ $\ell n \left|\frac{x-1}{x-2}\right|$ D/ 1+ℓn /x-2/

272. $\int_{\sqrt{e}}^{e} \ell nx \, dx \; is \; equal \; to$

A/ $\frac{e}{4}$ B/ $\sqrt{e}\left(\sqrt{e} - 1\right)$ C/ $\frac{\sqrt{e}}{2}$ D/ $\frac{1}{2}$

273. $\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}}$ dx=_____

A/ e-1 B/ 2(e-1) C/ 2e D/ e

274. $\int_0^{\frac{\pi}{6}} \frac{\tan x}{\cos x} \, dx =$_____

A/ 1 B/ $\frac{2\sqrt{3}}{3}$ - 1 C/ -1 D/ ½

275. What is the value of $\int_0^1 \frac{x}{(x^2+1)^2}$dx?

A. $\frac{1}{4}$ B. $\frac{1}{2}$ C. 1 D. $-\frac{1}{4}$

276. What is the area under the curve y = 3sinx over the interval [0, $\frac{2\pi}{3}$]?

A. 3\2 square units B. 7\3 square units C. 9\2 square units D. $13\sqrt{2}$ square units

277. $\int 10^x \, dx$ is equal to:

A. $10^x ln10$ B. $10^x + C$ C. $10^x ln10 + C$ D. $10^x loge + C$

278. An anti derivative of $f(x) = \frac{1}{1+e^{-x}} \; is$:

A. $1 + e^{-x}$ B. $\ln(1 + e^{-x})$ C. $ln(1 + e^{-x})$ D. $e^x + e^{-x}$

279. What is the derivative of $f(x) = \int_0^{x^2+\pi} \frac{dt}{sint+1}$?

A. $\frac{cosx}{\sin(x^2+\pi)+1}$

B. $\frac{2x}{\sin(x^2+\pi)+1}$

C. $\frac{2xcosx}{\sin(x^2+\pi)+1}$

D. $\int_0^{2x} \frac{dt}{sint+1}$?

280. What is the area of the region between the graph of

$y = -x^2 + 2 \; and \; y = |x|, where - 1 \leq x \leq 2$?

A. $\frac{11}{6}$ B. $\frac{25}{6}$ C. $\frac{7}{3}$ D. $\frac{11}{3}$

281. Which one of the following is equal to $\int_0^{\frac{\pi}{2}} \frac{x-sinx}{secx} dx$?

A. $\frac{\pi-3}{2}$ B. $\frac{\pi-1}{2}$ C. $\frac{3-\pi}{2}$ D. $\frac{\pi+3}{2}$

282. What is the area of the region between the graph of $f(x) = -x^2 + 4x - 3$ and the x-axis from x=0 to x=3?

A. $\frac{-2}{3}$ B. $\frac{2}{3}$ C. $\frac{4}{3}$ D. $\frac{8}{3}$

283. Which one of the following is equal to $\int \frac{x+\ln(x+1)}{(x+1)^2} dx$?

A. $\ln(x+1) + \frac{x}{x+1} + c$ C. $(x+1)^2 - \frac{1}{x+1} + c$

B. $(x+1)^2 + \frac{1}{x+1} + c$ D. $\frac{xln(x+1)}{x+1} + c$

284. If F(x) is an anti derivative of $f(x) = 1 - \frac{2}{x^2}$ and F(1)=0, then F(2) is equal to:

A. 0 B. $\frac{1}{2}$ C. $\frac{-1}{2}$ D.3

285. Which one of the following is equal to $\int (1+x)3^x\, dx$?

A. $(1+x)3^x - 3^x + c$ C. $(1+x)3^x + (\log_3 e)3^x + c$

B. $(1+x)3^x \log_3 e - (\log_3 e)^2 3^x + c$ D. $(1+x)3^x \log_3 e - 3^x \log_3 e + c$

286. What is the area of the region between the graphs of $y = x^2$ *and* $y = -x + 2, where\ 0 \le x \le 2$?

A. 3 B.2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

287. Which one of the following is equal to $\int \frac{\ln(xe^x)}{x} dx$?

A. $\ln|x| + \frac{1}{2}e^x + c$ C. $\ln|x| + e^{2x} + c$

B. $\frac{1}{2}(lnx)^2 + x + c$ D. $-\frac{1}{x^2} + (lnx)^2 + c$

288. What is an antiderivative of $f(x) = \frac{2}{4x^2+4x+1}$?

A. $\frac{1}{2x+1}$ B. $\frac{-2}{2x+1}$ C. $-\frac{1}{2x+1}$ D. $ln(4x^2 + 4x + 1)$

289. What is the value of $\int_0^{\frac{\pi}{2}} 2xcosxdx$?

A. $\frac{\pi}{2} + 1$ B. $\pi - 2$ C. $\pi + 2$ D. $\frac{\pi}{2} - 1$

290. Which one of the following is equal to $\int \frac{1}{x^2+x} dx$?

A. $\ln|x^2 + x| + c$ C. ln|x|-ln|1+x| + c

B. $2\ln|1+x| + \ln|x| + c$ D. $\ln|1+x| + \ln|x| + c$

291. Which of the following is the area of the region enclosed by the graph of $y = x^2$ on the interval [1, 4]?

A. 14/3 B. 28/3 C. 15/2 D. 7

292. What is the value of $\int_4^5 \frac{dx}{(x-3)^2}$?

A. $-\frac{7}{4}$ B. $-\frac{1}{2}$ C. $\frac{1}{2}$ D. $\frac{7}{4}$

293. Which one of the following is the value of $\int_0^2 x^2 \ln(1+x^3) dx$?

A. $\frac{2}{3}ln2 - \frac{2}{3}$ B. $6ln3 - \frac{10}{3}$ C. $6ln3 - \frac{8}{3}$ D. $18ln3 - 24$

294. Which one of the following is the volume of the solid obtained when the graph of $y = sinx\ on\ [0, \pi]$ is rotated about the x-axis?

A. $\frac{1}{2}\pi^2$ B. $\frac{1}{2}\pi^2 - 1$ **C.** $\frac{1}{2}\pi$ D. $\frac{1}{2}\pi + 1$

295. When evaluated $\int \frac{1}{\sqrt{x}} cos\sqrt{x}\ dx\ is\ equal\ to$:

A. $sin\sqrt{x} + cos\sqrt{x} + c$ C. $2sin\sqrt{x} + c$

B. $-\sqrt{x}cos\sqrt{x} +$ D. $\frac{1}{2}\sqrt{x}\ sinx + c$

296. Which one of the following is an antiderivative of $f(x) = tanx$?

A. $\frac{1}{2}tan^2x$ **B.** sec^2x **C.** $ln(cosx)$ **D.** $ln(secx)$

297. The volume of the solid which is generated when the region bounded by $y = \sqrt{x+1}$ and the x-axis from x=0 to x= 2 is rotated about the x-axis is equal to

A. 4π B. 3π C. $\frac{4}{3}\pi$ D. $\frac{3}{4}\pi$

298. If $f(x) = 3x^2\sqrt{x^3-1}$, then which of the following is an anti-derivative of $f(x)$?(2008E.C)

A. $\frac{3x}{2}\left(x^3-1\right)^{\frac{3}{2}}+c$ **C.** $\frac{2}{3}\left(x^3-1\right)^{\frac{3}{2}}$

B. $\frac{3}{2}\left(x^3-1\right)^{\frac{3}{2}}$ **D.** $\frac{3}{2}\left(x^3-1\right)^{\frac{2}{3}}+c$

299. Which one of the following is equal to $\int \frac{(lnX)^2+x^2cosx}{x}dx$? (2008E.C)

A. $\frac{1}{x^2}lnx + xsinx - cosx + c$ **C.** $\frac{1}{3}(lnx)^3 + xsinx - cosx + c$

B. $\frac{1}{3}(lnx)^3 + xsinx + cosx + c$ **D.** $\frac{1}{x^2}lnx + xsinx + cosx + c$

300. The volume of the solid generated when the region bounded between the graph of $y = \begin{cases} x^2, 0 \le x \le 2 \\ 4, \ 2 \le x \le 3 \end{cases}$ and x-axis is rotated about the x-axis is: (2008E.C)

A. $\frac{32\pi}{5}$ **B.** $\frac{112\pi}{5}$ **C.** $\frac{112\pi}{3}$ **D.** $\frac{64\pi}{5}$

301. The value of $\int_0^1 (x+1)e^{(x^2+2x)}\,dx$ is: (2008E.C)

A. $\frac{e^3}{2}$ **B.** $\frac{e^4-e}{2}$ **C.** $\frac{e^3-1}{2}$ **D.** e^3-1

302. $\int_0^3 (x+1)^{\frac{1}{2}}dx =$ _____**(2008E.C)**

A. 21/2 **B. 14/3** **C. 7** **D. 16/3**

303. Given $f(x) = \begin{cases} x+1, & for\ x < 0 \\ cos\pi x, & for\ x \ge 0 \end{cases}$, then $\int_{-1}^{1} f(x)dx =$ _____(2008E.C)

A. $\frac{1}{2}+\frac{1}{\pi}$ **B.** $\frac{1}{2}-\frac{1}{\pi}$ **C.** $\frac{1}{2}$ **D.** $-\frac{1}{2}$

304. The value of $\int \frac{x^2}{e^{x^2}}dx$ is: (2008E.C)

A. $-\frac{1}{3}lne^{x^2} + C$ **C.** $\frac{1}{3}lne^{x^2} + C$

B. $\frac{1}{3e^{x^2}} + C$ **D.** $\frac{x^2}{3e^{x^2}} + C$

305. The volume of a cylindrical tin can with a top and a bottom is 16π cubic inches. If a minimum amount of tin is to be used to construct the can, what must be the height of the can in inches?(2008)

A. $2\sqrt[3]{2}$ **B.** $2\sqrt[3]{4}$ **C. 4** **D. 8**

306. The area of the region enclosed by the graphs of $y = x$ and $y = x^2 - 3x + 3$ is: (2008)

A. 2/3 **B. 4/3** **C. 2** **D. 14/3**

307. What is the area of the region between the graph of $y = -x^2 + 1$ and the $x-axis$ where $0 \le x \le 2$? (2008)

A. 2/3 **B. 7/3** **C. 3** **D. 2**

308. The area of the region bounded by the curve $y = e^{2x}$, the x-axis, the y-axis, and the line x= 2 is:

A. $\frac{e^4}{2} - e$ **B.** $\frac{e^4}{2} - 1$ **C.** $\frac{e^4}{2} - \frac{1}{2}$ **D.** $2e^4 - e$

309. If F and f are continuous functions such that $F'(x) = f(x)$ $for\ all\ x$. then $\int_a^b f(x)dx$ is:(2008)

A. $F'(a) - F'(b)$ **C.** $F(a) - F(b)$

B. $F'(b) - F'(a)$ **D.** $F(b) - F(a)$

310. The region is enclosed by the graph of $y = x^2$, the line x =2, and the x-axis is revolved about the y-axis. The volume of the solid generated is: (2008)

A. 8π **B.** $\frac{32}{5}\pi$ **C.** $\frac{16}{3}\pi$ **D.** 4π

311. $If\ F(x) = \int_o^x e^{-t}\,dt, then\ what\ is\ value\ of\ F'(X)?$

A. e^{-x} B$-e^{-x}-1$ $C.\frac{e^{-x+1}}{-x+1}$ $D.-e^{-x}$

312. What is the value of $\int_1^2 \frac{inx}{x^2}\ dx$

A. $-\frac{in2}{2}-\frac{1}{2}$ $B.\frac{In2}{2}-\frac{1}{2}$ $C.-\frac{In2}{2}+\frac{1}{2}$ $D.\frac{In2}{2}+\frac{1}{2}$

313. What is the value of $\int \frac{x^{e-1}+e^{x-1}}{x^e+e^x}$ dx?

A. $\frac{1}{e}\ in(\ x^e+e^{x+1})+c$ C. $\frac{1}{e}in\ ((x+1)^e+e^{x+1})+c$

B. $\frac{1}{e}\ in(\ x^e+e^x)+c$ D. $\frac{1}{e}in\ (x^{\ e+1}+e^{\ x+1})+c$

314. If the region enclosed by the graphs of $f(x) = x^2$ and $f(x) = x^3$ from x=0 to x=1 rotates about the $x - axis$, what is the volume of the solid of revolution?

A. $\frac{2\pi}{27}\ cubic\ units$ $C.\frac{2\pi}{5}cubic\ units$

B. $\frac{2\pi}{25}cubic\ units$ $D.\frac{2\pi}{35}cubic\ units$

315. $If\ F(x) = \int_o^x e^{-t}\,dt, then\ what\ is\ value\ of\ F'(X)$?

A. e^{-x} **B**$-e^{-x}-1$ $C.\ \frac{e^{-x+1}}{-x+1}$ $D.-e^{-x}$

316. What is the value of $\int_1^2 \frac{inx}{x^2}\ dx$

A. $-\frac{in2}{2}-\frac{1}{2}$ $B.\frac{In2}{2}-\frac{1}{2}$ $C.-\frac{In2}{2}+\frac{1}{2}$ $D.\frac{In2}{2}+\frac{1}{2}$

317. What is the area of the region bounded by the lines $x = 0. x = 2, and\ y = 1\ and\ the\ curve\ y = e^{2x}$?

A. $\frac{e^4}{2}-\frac{5}{2}$ $B.\ \frac{e^2}{2}-\frac{1}{2}$ $C.\ \frac{e^3}{3}-\frac{1}{3}$ $D.\ -\frac{e^4}{2}+\frac{5}{2}$

318.

CHAPTER 6

319. Suppose p(1,2,1) and Q(1,0,2) are points in space and $\vec{A} = \overrightarrow{PQ}$. If $\vec{B}$ is parallel to $\overrightarrow{PQ}$ and $\overrightarrow{B}$ is parallel to $\overrightarrow{PQ}$ and $\vec{A}\ .\ \vec{B}$ = -10, then which one of the following is true?

A. $\vec{A}$ and $\vec{B}$has the same direction C. $\| \vec{B} \| = \frac{1}{10} \| \vec{A} \|$

B. $\| \vec{B} \| = 10 \| \vec{A} \|$ D. $\| \vec{B} \| = 2 \| \vec{A} \|$

320. Which one of the following points is closer to the sphere $y^2 + x^2 - z^2 - 2x + 6z + 9 = 0$

A. (1, 0, 0) B. (0, 0, 0) C. (0, -1, 0) D. (0, 0, -1)

321. If (-1, 2, 2) and (1, 0, -2) are endpoints of a diameter of a sphere, then which one of the following is true about the sphere?

A. (0, 1, 0) is a point on the sphere
B. The equation of the sphere is $x^2 + (y - 1)^2 + z^2 = 6$
C. The equation of the sphere is $x^2 + (y - 2)^2 + z^2 = 6$
D. The radius of the sphere is 6

322. Suppose that the equation $x^2 + y^2 + z^2 + 2x + 8z = 6(y + 1)$, represents a sphere. Where is the point (1, -1, 4) located relative to the sphere?

A. Inside the sphere, C. At the center of the sphere
B. On the sphere D. outside the sphere

323. Suppose ℓ is the line through the center of the sphere $x^2 + y^2 + (z - 2)^2 = 9$ and the intersects sphere at (1, 2, 4).

What is the cosine of the angle between ℓ and positive z- axis?

A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{3}{5}$ D. $\frac{4}{5}$

324. If $P = (3, \propto - 1, \propto + 2)$ and $Q = (2\propto + 1, 3, 3\propto)$ are points in space, what should be the value (s) of $\propto$ so that the distance between the two points is 6 ?

A. $\propto = -2$ or $\propto = 5$ C. $\propto = -1$ or $\propto = 3$
B. $\propto = 0$ or $\propto = 5$ D. $\propto = -3$ or $\propto = 2$

325. Which of the following is the radius of the sphere whose equation is

$$x^2 + y^2 + z^2 - 2x + 4y + 4 = 0?$$

A/ 0 B/ 2 C/ 3 D/ 1

326. For what value of d is the sphere $x^2 + y^2 + z^2 - 2x + dz = -1$ of radius 7 units?

A. -14 B. $-10\sqrt{2}$ C.$7\sqrt{2}$ D.$10\sqrt{2}$

327. Which of the following is a point of intersection of the sphere$(x - 1)^2 + (y - 2)^2 + (z + 1)^2 = 6$ and the y- axis?

A. (0,-2, 0) B. (0,2, 0) C.(0, -4, 0) D.(0, 4, 0)

328. If the line $z = 4 - \sqrt{3}y \; for \; x = -1$ is tangent to the sphere whose equation is: $(x + 1)^2 + y^2 + z^2 = 4$, then what is the distance of the line from the center of the sphere?

A.2 B. 3 C. $2\sqrt{3}$ D. 4

329. If a sphere with center C(0,1, 1) intersects the z-axis at p(0,0,3), then the radius of the sphere is equal to

A. 5 B. 3 C. $\sqrt{3}$ D. $\sqrt{5}$

330. Suppose A and B are the end points of a diameter of the sphere whose equation is $x^2 + y^2 + (z + 2)^2 = 1$. If A=(1, 0, -2), then B is equal to

A. (1, 0, -2) B. (0, 0, -1) C. (-1, 0, -2) D. (0, -1, -2),

331. Let l_1 and l_2 be two lines in space intersecting at the origin, (0,0,0). If l_1 and l_2 pass through point A(1,1,0) and B(0,1,1), respectively, then the angle between *l_1 and l_2 is equal to*

A. 30^0 B.45^0 C. 60^0 D. 90^0

332. Let the angle between $\vec{V} = -2i - j + 2k$ and $\overrightarrow{PQ}$ be 60^0, where P and Q are points in space. If $\vec{V}.\overrightarrow{PQ} = 2$, then what is that distance between P and Q?(2008)

A. $3/4$ B. 5/4 C. 4/5 D. 4/3

333. If one of the end point of the line segment is (3, 2, -4) and the midpoint is (4, 1, -2), then the coordinate of the other end point is: (2008)

A. (5, 0, 0) B. (2, 0, 5) C. (5, 1, 2) D. (3, 1, 0)

334. What is the image of the circle $x^2+y^2-4x-6y+11=0$, when the origin is shifted to the point (1,1) after translation of axes?

A. $x^2 + y^2 - 6x - 8y + 23 = 0$ C. $x^2 + y^2 + 6x + 8y - 23 = 0$

B. $x^2 + y^2 - 4x - 6y + 3 = 0$ D. $x^2 + y^2 - 4x - 2y + 3 = 0$

335. If the point $((\propto ,0,3)$ is on the sphere centered at (1, 2, 3) with radius 2, what is the value of $\propto$?

A. 0 B. 1 C. 2 D. -3

336. Consider a rectangle ABCD with base vertices A= (0, 3) and B= (4, 0) and the other vertices, C and D, in the first- quadrant of the coordinate plane. If its height $\overline{BC}$ is half of the length of its base, then which of the following indicates the coordinates of vertex C?

A. (4,5/2) B. (6, 3/2) C. (5/2,-2) D. (11/2,2)

337.

CHAPTER 7

338. Consider the formula for a natural number $n \in \mathbb{N}$:

$$2 + 4 + 8 + \ldots + 2^n = 2^{n+1} + 1$$

To proof this formula a person has used the following argument. "***Assume the formula is true for n = k, for some k*** $\in \mathbb{N}$***. Then the person has shown that the formula is also true forn = k + 1. And then, the person has concluded that, by the principle of mathematical induction, the formula is true for all natural numbers n*** $\in \mathbb{N}$" Which one of the following statements is True about the above arguments?

A. The formula holds true through it does not work for n = 1.

B. Since the left – hand- side is an even number and the right- hand – side an odd number, the principle of mathematical induction is False.

C. This is one example where the principle of mathematical induction fails to work.

D. The above formula does not work for all natural numbers $\boldsymbol{n} \in \mathbb{N}$**.**

339. Which of the following statements is not true?

A/ If x and y are even integers, then xy is also even. C/ If 3n+2 is odd, then n is odd.

B/ The sum of two consecutive integers is a multiple of 4. D/ $\forall n \epsilon N, n^2 < n^3$

340. The valid conclusion from the premises: $P \vee Q$, $Q \rightarrow R, P \rightarrow M$, $\neg M$ *is* _____ (2008E.C)

A. $P \wedge (R \vee R)$ **C. $Q \wedge (P \wedge R)$**

B. $P \wedge (P \wedge R)$ **D. $R \wedge (P \vee Q)$**

341. Which one of the following is a valid assertion that can be proved by the principle of mathematical induction? (2008E.C)

A. $2^n > 10n$ *for every integer n such that* $n \geq 6$

B. $r^n > 0$ *for every real number r such that* $r \geq 1$

C. $n^2 + 10n > 2n^2$ *for every natural number* $n \geq 1$

D. $2^n > 8n$ *for every integer n such that* $n \geq 3$

342. Consider the following assertion of a person and his proof. (2008E.C)

" If x and y are equal to positive integers, then x + y = y."

Proof: the following steps and reasons are used to proof the assertion.

Step	Reason
1. $x = y$	given hypothesis
2. $x^2 = xy$	Multiply both sides of (1) by x
3. $x^2 - y^2 = xy - y^2$	Subtract y^2 from both sides of (2)
4. $(x-y)(x+y) = (x-y)y$	factor both sides of (3)
5. $x + y = y$	divided both sides of (4) by x-y

Step 5 completes the proof.

Which one of the following is true about this proof?

A. It is a correct direct proof of the assertion.

B. It follows the technique of a proof by contradiction because the steps lead to a contradiction.

C. The proof is invalid because step 4 does not lead to 5

D. The proof is invalid because step 4 does not follow from step 3

343. $\forall n \in N, 3 \times 5^{2n+1} + 2^{3n+1}$ *is divisible by* **(2008E.C)**

A. 25 B. 23 C. 19 D. 17

344. To show for a mathematical statement "$(\forall x)p(x)$ *is Not true*"**, which proof type is appropriate? (2008E.C)**

A. Direct proof **A. indirect proof**

B. Showing by counter example **D. proof by contradiction**

345. $\forall n \in N, 3^n - 2$ is prime that can be proved or disproved by which one of the following mathematical proofs?

A. Direct proof C. Disprove by counter example

B. Proof by exhaustion D. proof by contradiction

346. Which one of the following is a valid assertion that can be proved by the principle of mathematical induction?

A. $3n + 25 < 3^n$, for every integer $n \geq 3$.

B. $2^n > n + 20$, for every integer $n \geq 4$.

C. $n^2 \leq 2^n$, for every $n \geq 1$.

D. $n^3 - n$ *is divisible by* 6, *for evry intiger* $n \geq 1$.

347. Which of the following is a correct assertion that can be proved by the principle of mathematical induction?

A. $\frac{1}{n+1} \leq 1$, *for each real number* $n \geq 1$.

B. $m! \leq 4^m$, for each positive integer m.

C. $2^p - 1$ is prime for each prime integer p.

D. $k! \geq 2^k$,for each integer $k \geq 4$.

348.

The end

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