



ABUNE TEKLE HAYMANOT HIGHER SECONDARY ACADEMY 2012 E.C 2ND SEMESTER

MODEL -4 MATH'S FOR GRADE 12TH NATURAL SCIENCE

DIRECTION: THE PAPER CONTAINS MATHEMATICS EXAMINATION FOR GRADE 12 FOR NATURAL SCIENCE STREAM ONLY. THE EXAMINATION CONTAINS 65 ITEMS. THERE IS ONLY ONE BEST ANSWER FOR EACH ITEM. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND WRITE THE LETTER OF YOUR CHOICE ON YOUR ANSWER SHEET. YOU ARE ALLOWED TO WORK ON THE EXAM FOR 3 HOURS.

- Which of the following function is neither even nor odd ?
 A. $f(x) = -|x| + \pi^{|x|}$ C. $h(x) = |\sin x|$
 B. $f(x) = \pi^{3/5}$ D. $h(x) = \pi^{2n-1} + |x|, n \in \mathbb{N}$
- Given $f(x) = x^3$, which is not true of $H(x) = |f(x)|$?
 A. It has range of $[0, \infty)$ C. domain of $h = \mathbb{R}$
 B. H is concave up in its domain D. H increases in its domain
- Let $f(x) = \frac{x-2}{1-x}$ and $g(x) = \frac{x+1}{x+2}$ domain of $(f \circ g)(x) =$ -----
 A. $\mathbb{R}$ B. $\mathbb{R} \setminus \{1, -2\}$ C. $\mathbb{R} \setminus \{0\}$ D. $\mathbb{R} \setminus \{-2\}$
- The solution set of $\frac{x+4}{x-5} - \frac{1}{x+5} = \frac{10}{x^2+25}$ is
 A. $\{-3, -5\}$ B. $\{3\}$ C. $\{\}$ D. $\{-3\}$
- Solution set of $\frac{1}{3-x} + \frac{2}{x} \geq 0$ is
 A. $(-\infty, 0) \cup (3, 6)$ C. $(0, \infty)$
 B. $(0, 3) \cup (6, \infty)$ D. $\mathbb{R}$
- Which is **not** true about the graph of $y = \frac{x^2+1}{x^2-4}$?
 A. The graph has no x, intercept
 B. Graph crosses horizontal asymptote
 C. $X \rightarrow \infty \Rightarrow f(x) \rightarrow 1$
 D. $X \rightarrow 2^- \Rightarrow f(x) \rightarrow -\infty$
- What is the focus of the parabolas $y^2 + 4y + 8x = 4$?
 A. $(1, -2)$ B. $(-1, -2)$ C. $(3, -2)$ D. $(-3, -2)$
- If the equation $(x-2)^2 - (y-2)^2 = 1$ represents a hyperbola. which one of the following represents eqn of an asymptote to the hyperbola?
 A. $Y = 4 - x$ C. $X + y = 1$
 B. $x = 2 - y$ D. $x + 2y = 3$
- Which of the following is true about $f(x) = \frac{x^2+x+2}{x^2-16}$?
 A. The graph of has a horizontal asymptote $y = 1$
 B. The graph of has vertical asymptote $x = 2$ & $x = -2$
 C. The graph of & crosses the y-axis at $(0, \frac{1}{8})$
 D. The graph of & has a vertical asymptotes at $x = 2$ only
- The distance b/n the pair of parallel lines $x - y + 3 = 0$ and $x - y + 4 = 0$ is
 A. $\sqrt{\frac{5}{2}}$ B. $\frac{\sqrt{2}}{2}$ C. $\frac{\sqrt{3}}{7}$ D. $\frac{\sqrt{7}}{7}$
- The equation of the circle with centre $(1, 1)$ and tangent to the line $L : y - x + 2 = 0$
 A. $2x^2 + 2y^2 + 4x - 8y + 15 = 0$ C. $x^2 + y^2 - 2x - 2y = 0$
 B. $2x^2 + 2y^2 + 4x - 8y + 15 = 0$ D. $x^2 + y^2 - 2x - 4y - 12 = 0$
- The inverse of the function $f(x) = \frac{7^x - 7^{-x}}{7^x + 7^{-x}}$ is



- A. $f^{-1}(x) = \log_{14} \left(\frac{x+1}{x-1} \right)$ C. $f^{-1}(x) = \log_7 \sqrt{\frac{x+1}{1-x}}$
 B. $f^{-1}(x) = \log_{49} \left(\frac{x+1}{x-1} \right)$ D. $f^{-1}(x) = \log_{49} \sqrt{\frac{x-1}{x+1}}$
13. If $Z = -1+i$, then the principal argument of Z^9 is ?
 A. $\pi/4$ B. $-3\pi/4$ C. $3\pi/4$ D. $-\pi/4$
14. The modulus of a complex number $\left(\frac{1+\sqrt{3}i}{-2+2i} \right) \left(\frac{-\cos\theta + i\sin\theta}{\cos\theta - i\sin\theta} \right)$
 A. $\sqrt{7}/2$ B. $\sqrt{8}$ C. $\sqrt{2}/2$ D. $\sqrt{3}$
15. If the proposition $p \Rightarrow \neg q$ is false which of the following is true ?
 A. $\neg p \wedge (p \Rightarrow q)$ C. $(\neg q \vee p) \Leftrightarrow q$
 B. $\neg p \vee (q \Rightarrow \neg p)$ D. $(p \wedge q) \Leftrightarrow \neg q$
16. Let $x, y \in \mathbb{R}$ then which of the following is true ?
 A. $(\forall x)(\forall y)(x^2 + y + 3 = 0)$ C. $(\forall x)(\exists y)(x^2 + y + 3 = 0)$
 B. $(\exists x)((\forall y)(x^2 + y + 3 = 0))$ D. $(\exists x)((\exists y)(x^2 + y + 3 = 0))$
17. Which of the following proposition is equivalent to $\neg p \Rightarrow q$?
 A. $\neg(p \vee q)$ B. $\neg p \vee \neg q$ C. $p \vee q$ D. $\neg p \Leftrightarrow q$
18. Let p and q be statements which of the following argument is valid ?
 A. $\neg p \Rightarrow \neg q, p \vdash p$ C. $p \vee q, \neg p \vdash q$
 B. $p \Rightarrow q, q \vdash p$ D. $p \rightarrow q, q \vdash \neg p$
19. A box contains 10 bulbs with 3 defective ones. If 2 bulbs are drawn at random from the box. which one of the following is the probability that at most 1 bulb is defective ?
 A. $14/15$ B. $25/35$ C. $54/55$ D. $22/45$
20. How many four digit numbers can be formed using 0,1,2, - - - 9, if no repetition and unit digit is 2 ?
 A. 112 B. 224 C. 448 D. 896
21. How many arrangements can be formed using the letter in "BLUES" ?
 A. 6 B. 24 C. 120 D. 60
22. The standard deviation of the data 4,5,2,6,4,3,4 is
 A. 10 B. 1.66 C. 120 D. 1
23. Probability of occurrence every with odds in favor of an event are 7: 9 is
 A. $9/16$ B. $3/8$ C. $7/16$ D. $7/8$
24. The probability of getting a vowel in random selection of a single letter from the word "ETHIOPIA"
 A. $\frac{1}{2}$ B. $\frac{1}{12}$ C. $\frac{1}{36}$ D. $\frac{1}{9}$
25. If A is 3×3 matrix and $|A| = 4$, then $|3A| =$ _____
 A. 96 B. 108 C. 118 D. 27
26. Suppose $A = \begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 2 \\ 6 & -2 \end{pmatrix}$ if C is 2×2 matrix such that $C + \frac{1}{2}B^T = AB$ then C is equal to
 A. $\begin{pmatrix} -3 & 1 \\ 14 & 6 \end{pmatrix}$ B. $\begin{pmatrix} 2 & 2 \\ 10 & 4 \end{pmatrix}$ C. $\begin{pmatrix} 2 & -1 \\ 13 & 3 \end{pmatrix}$ D. $\begin{pmatrix} 4 & 3 \\ 11 & 8 \end{pmatrix}$
27. If A and B are 3×3 matrices and the determinates $|A| = 3$ and $|B| = 2$ then the value of $13 (AB)^{-1}$ is
 A. 1 B. $5/3$ C. $3/2$ D. $9/2$
28. $\begin{pmatrix} 1 & 2 & -1 \\ -x & 1 & 2 \\ 2 & -1 & x \end{pmatrix}$ is singular if $x =$ _____
 A. $\mathbb{R}$ B. $\{-2, 2\}$ C. $\{-4, 4\}$ D. $\{ \quad \}$



29. $(1 + i)^{10}$ is equal to :
A. $32(1 + i)$ B. i C. 32 D. $32i$
30. Which one of the following the value of C that satisfy the mean value thermo for $f(x) = 3x^2 + 2x + 6$ in the interval $[-2, 1]$
A. $-1/6$ B. $1/3$ C. $-1/3$ D. 0
31. Which of the following is true about the graph of the function $f(x) = x^4 - 6x^2$?
A. It is strictly increasing on the interval $[0, \sqrt{3}]$
B. It is concave upward on $(-1, 1)$
C. It is strictly decreasing in $(-\infty, -\sqrt{3}]$
D. $(0, 0)$ is an inflection point.
32. $\lim_{x \rightarrow 0} \frac{x - 4|x|}{x}$ is equal to
A. -3 B. 5 C. 0 D. does not exist
33. $\lim_{x \rightarrow 0} \frac{\sec x - \cos x}{3x^2} \cdot \frac{1}{a}$, where $a =$ _____
A. 6 B. -4 C. 2 D. 3
34. Which one is Not true of $f(x) = \begin{cases} 2x^3, & x < -1 \\ 3x + 1, & -1 \leq x < 0 \\ \cos x, & x > 0 \end{cases}$
A. f is continuous at $x = -1$
B. f is left continuous at $x = -1$
C. f is continuous at $x = \pi$
D. f is continuous at $x = 0$
35. If $f(x) = \begin{cases} \frac{a \sin x}{x - |x|}, & x < 0 \\ e^{-x} - \cos x, & x \geq 0 \end{cases}$ is continuous at $x=0$, then a is equal to :
A. -2 B. 2 C. $-1/2$ D. 4
36. $\lim_{x \rightarrow 0} \frac{\sin x}{x + \tan x}$ is equal to:
A. $-1/2$ B. 1 C. 2 D. $1/2$
37. The equation of the tangent line the graph of $f(x) = 2x - \sin(1-x)$ at $(1, 2)$ is:
A. $Y = 3x - 1$ B. $y = 3x - 5$ C. $y = x + 1$ D. $y = x - 3$
38. $1 + f(x) + x^2 (f(x))^2 = 0$ and $f(1) = 2$ then $f'(1) =$ _____
A. $-16/13$ B. $13/16$ C. $16/13$ D. $-13/16$
39. Two sides of a triangle have length 12m & 15m the angle b/n them is increasing at a rate of $2^\circ/\text{min}$. How fast in m/min is the length of the third side increasing when the angle b/n the sides of fixed length is 60° ?
A. $\sqrt{7}\pi/21$ B. $\sqrt{3}\pi/21$ C. $\sqrt{7}\pi/7$ D. $\sqrt{7}\pi/3$
40. Suppose $x + 1$, $4x + 1$ and $8x - 1$ are consecutive term of terms of an arithmetic progression what is the value of x
A. 5 B. 2 C. 3 D. 4



41. What is the sum of all natural number from 1 to 500 which are divisible by 3 ?
A. 45830 B. 41583 C. 1275 D. 166
42. If the sum of n terms of an A.P is $2n+3n^2$, find the 6th terms of A.P ?
A. 120 B. 35 C. 36 D. 60
43. A ball is dropped from a height of 16m it continuously rebounds to $\frac{3}{4}$ of the distance of its previous fall how high does it rebounds its fourth time ?
A. 27/4 B. 81/16 C. 243/64 D. 23/7
44. The sum of infinite geometric series $1 + \frac{1}{3} + \frac{1}{9} + \dots$ is
A. $\frac{2}{3}$ B. $\frac{3}{2}$ C. $-\frac{3}{2}$ D. $-\frac{2}{3}$
45. $\int \frac{6x}{(x^2+1)^2} dx =$ _____
A. $-\frac{3}{x^2+1} + c$ B. $(x^2+1)^3 + c$ C. $\frac{-x}{x^2+1} + c$ D. $\frac{3}{x^2+1} + c$
46. $\int x \sin x dx =$ _____
A. $\sin x - x \cos x + c$ C. $x^2 \sin x - x \cos x + c$
B. $x^2 \cos x + c$ D. $-\sin x + x^2 \cos x + c$
47. $\int 2x (x^2 + 1)^4 dx$ is equal to :
A. $\frac{1}{5} (x^2 + 1)^5 + c$ C. $\frac{x}{5} (x^2 + 1)^5 + c$
B. $\frac{2x}{5} (x^2 + 1)^5 + c$ D. $\frac{2}{5} (x^2 + 1)^5 + c$
48. The area of the region bounded by the curve $y = e^x$, the Lines $y = 1$ and $x = 1$ is ?
A. $e - 2$ B. $2e$ C. e D. 1
49. the volume generated when region above the x - axis and below $f(x) = 2x - x^2$ is revolved about the x - axis is ?
A. $8\pi/15$ B. $4\pi/3$ C. $8\pi/7$ D. $16\pi/3$
50. For collinear points A, B, C where B is b/n A & C then $\vec{BC} =$ _____
A. $\vec{AB}$ B. $\vec{AC} - \vec{BC}$ C. $\vec{BC} - \vec{AC}$ D. $\vec{AC} + \vec{BC}$
51. Let a and b be vectors such that $|a| = 4$ and $|2a - b| = |a + b|$. Which one of the following is equal to $a \cdot b$?
A. 12 B. 10 C. 8 D. 24
52. Image of a point (3,5) under a reflection M through $y = 2$ is
A. (3, 2) B. (3, -2) C. (3, -1) D. (-5, -3)
53. If a translation T sends (0,0) to (2,3) and a reflection M maps (-1,5) to (3,1) then $T(M(2,4)) =$
A. (4, 8) B. (3, 4) C. (4, 7) D. (4, 3)
54. The image of a line $3x + 2y = 2$ under anti-clockwise after it has been rotated by 90° about the point (1,2) is ?
A. $3y = 2x - 1$ B. $y = 2x - 3$ C. $3y - 2x = 4$ D. $2y - x = 1$
55. The parametric vector equation of a line through the points (1,-3) and (-3,5) is :
A. $x = 1+t, y = 3+2t, t \in \mathbb{R}$
B. $x = 1-t, y = -3+2t, t \in \mathbb{R}$
C. $x = -t, y = 3-2t, t \in \mathbb{R}$



- D. $x = 1-t, y = 2-3t \quad t \in \mathbb{R}$
56. $\sec(\sin^{-1}(3/5))$ is equal to :
- A. $4/5$ B. $5/3$ C. $5/4$ D. $4/3$
57. Let $f(x) = -3 \sin(\frac{1}{2}x)$. which one is true ?
- A. Amplitude of f is -3
B. Range of f is $[-1, 1]$
C. f decreases on $[-2\pi, 0]$
D. f increase on $[\pi, 3\pi]$
58. The solution set of $2\sqrt{3} \sin(x/2) = 3$ on $[0, 2\pi)$ is
- A. $\{\pi/4, 3\pi/4\}$ C. $\{\pi/3, 7\pi/3\}$
B. $\{5\pi/3, 7\pi/3\}$ D. $\{2\pi/3, 4\pi/3\}$
59. $\frac{1+\tan^2 x}{1+\cot^2 x} =$ _____
- A. $\cot^2 x$ B. $-\tan^2 x$ C. $\cot^2 x$ D. $-\cot^2 x$
60. Suppose A and B are end points of the diameter of the sphere whose equations is $x^2 + y^2 + (z+2)^2 = 1$ If A = (1, 0, -2) then B is equal to :
- A. (0, 1, -2) B. (0, 0, -1) C. (-1, 0, -2) D. (0, -1, 2)
61. If the line $z = 4 - \sqrt{3}y$, for $x = -1$ is tangent to the sphere whose equation is $(x-1)^2 + z^2 = 4$ then the distance b/n the line from the center of the sphere is ?
- A. $2\sqrt{2}$ B. $2\sqrt{3}$ C. $2\sqrt{5}$ D. 2
62. Suppose $\triangle ABC$ is an equilateral triangle is an inscribed circle of radius r , then the area of $\triangle ABC$ is
- A. $3r^2$ B. $6r^2$ C. $3r^2\sqrt{3}$ D. $2r^2\sqrt{3}$
63. The value of $4 \cot^2 45^\circ - \sec^2 60^\circ - \sin^2 30^\circ$ is
- A. $1/8$ B. 1 C. 0 D. $1/4$
64. Which one of the following is the coefficient of $x^2 y^3$ from the expansion of $(x+y)^5$
- A. 10 B. 25 C. 1 D. 4
65. $\int_{-\pi/2}^{\pi/2} (\sin x + \cos x) dx =$ _____
- A. 0 B. 1 C. 2 D. 4

 Read more
Stay @ home
Do your bests.

From: math's department