

**CHOOSE THE BEST ANSWER ON THE SPACE PROVIDED**

1, Which of the following n^{th} term formula define the sequence $\{0, 1, 3, 7, \dots\}$?

- A, $n-1$ B, $n! - n$ C, $n^2 - n$ D, $2^{n-1} - 1$

2, Let $\{a_n\}_{n=1}^{\infty}$ be a sequence with $a_1 = 1$, $a_{n+1} = (-1)^n + a_n$, then $a_{3n+1} - 3a_{5n+1} =$ -----?

- Assume n is odd. A, -2 B, 0 C, -3 D, 1

3, Let $\{a_n\}$ be an A.P with $A_4 \hat{=} 88$, $A_7 \hat{=} 76$, then what is the total number of terms whose value greater than 0?

- A, 15 B, 14 C, 16 D, 17

4, Let $\{a_n\}_{n=1}^{\infty}$ be a G.P if $a_1 + a_3 = 15 \wedge a_2 + a_4 = 30$, then what is the product of the third and sixth terms of this sequence?

- A, 12 B, 96 C, 960 D, 1152

5, If the sum of the first n - terms of an A.P is defined by $S_n \hat{=} n^2$, then $A_{10} - 4 \hat{=} \dots\dots\dots$?

- A, 13 B, 15 C, 14 D, 16

6, $\sum_{n=3}^{30} \left(\frac{2}{(n+1)(n+2)} \right) \hat{=} \dots\dots\dots$?

- A, 0 B, 2 C, 15/16 D, 7/16

7, A ball fall from a building whose height is 800m. If it rebound up 50% times the height it fall at each rebound, then what is the total vertical distance covered by the ball before it comes to rest?

- A, 24000m B, 2400m C, 240m D, 1200m

8, The greatest lower bound of the sequence $\{-1.3, -1.33, -1.333, \dots\}$ $\hat{=} \dots\dots\dots$?

- A, -4/3 B, -1.3 C, -1.33 D, -1.333

9, One of the following is always true. Which one?

- A, every bounded sequence is convergent.
B, every convergent sequence is bounded.
C. Every monotonic sequence is convergent.

D, every convergent sequence is monotonic.

10, Let $f: \mathbb{R} \setminus \{-3, -5\} \rightarrow \mathbb{R}$ defined by $f(x) = \frac{2}{(x+3)(x+5)}$, then

$$\lim_{n \rightarrow \infty} [f(1) + f(2) + f(3) + \dots + f(n)] = \dots\dots\dots? \text{ A, } \frac{1}{4} \text{ B, } \frac{1}{5} \text{ C, } \frac{9}{20} \text{ D, } 0$$

11, $\lim_{x \rightarrow 2} \frac{\sqrt{x^2 - 4x + 4}}{x - 2}$ -----? A, 4 B, -4 C, 0

D, $\nexists$

12, $\lim_{x \rightarrow 0} \left(\frac{1}{x\sqrt{x+1}} - \frac{1}{x} \right) = \dots\dots\dots? \text{ A, } -\frac{1}{2} \text{ B, } \frac{1}{2} \text{ C, } \nexists$

D, 1

13, If $f(x) = \begin{cases} \frac{1 - \cos(ax)}{x^2}, & \text{if } x > 0 \\ 2 \cos(x) + 2, & \text{if } x < 0 \end{cases}$ cont. at $x = 0$ then $a = \dots\dots\dots?$

A, 1 B, only 2 C, ± 2 D, $\nexists$

14, $\lim_{x \rightarrow \infty} \left(\frac{2}{x} + \frac{3}{2x+1} \right)^{4x+1} = \dots\dots\dots? \text{ A, } 0 \text{ B, } e \text{ C, } e^6 \text{ D, } e^{-1}$

15, Let $f(x) = \frac{|x-3|}{x^2 - x - 6}$, then $\lim_{x \rightarrow 3} f(x) = \dots\dots\dots? \text{ A, } 1 \text{ B, } -1 \text{ C, } \nexists$

D, 2

16, If a function $f(x)$ is continuous at $x = a$, then which one of the following is not always true?

A, $\lim_{x \rightarrow a} f(x)$ exist B, $f(a)$ is defined

C, $\lim_{x \rightarrow a} f(x) = f(a)$ D, $f'(a)$ exist

17, Let $f(3) = f(3) = -4$, then $\lim_{\Delta x \rightarrow 0} \frac{5f(3) - 5f(3 + \Delta x)}{\Delta x} = ?$

A, -20 B, 20 C, 5 D, 100

18, Let $F(x) = \begin{cases} \sin(x) + 2, & \text{if } x \geq 0 \\ 3x^2 + 4x + 8, & \text{if } x < 0 \end{cases}$, then what is the equation of tangent line to $F(x)$ at $x = \frac{\pi}{2}$ is -----?

A, $Y+3 = 0$

B, $Y-3 = 0$

C, $\#$

D, $Y = X+2$

19, Let $F(x) = \begin{cases} \sin(2\pi x)+2, & \text{if } x \leq 2 \\ \frac{x}{x-2}, & \text{if } x > 2 \end{cases}$, what is the largest interval of differentiability?

A, $\mathbb{R}$

B, $(-\infty, 2) \cup (2, \infty)$

C, $(-\infty, 2) \cup (2, \infty)$

D, $(-\infty, 2) \cup (2, \infty)$

20, Let $F(x) = K \ln(x) + e^{\sin(x)}$, if $F''(\pi) = -1$, then $K =$ -----?

A, π

B, π^2

C, 2π

D, $2\pi^2$

21, Let $f(x)$ be an even function such that $f'(a) = 2$, then $f'(-a) =$?

A, -2

B, 2

C, 0

D, any real number.

22, The set of all critical points of $F(x) = \frac{x+3}{\sqrt{x^2+1}}$, is(are) -----?

A, $\left\{-\frac{1}{3}, -3\right\}$

B, $\{3\}$

C, $\{1/3\}$

D, no critical number.

23, Let $f(x) = x^2 + ax + b$ satisfy ROLLE'S theorem on $[0, 4]$, then which of the following is the possible value of a and b respectively?

A, $\mathbb{R}, 4$

B, $4, \mathbb{R}$

C, $4, 1$ only

D, $4, \mathbb{R}^+$ only.

24, Let $f(x) = \frac{x^3}{3} + cx^2 + ax + 5$, has a local maximum value at $x = 1$, then which of the following is true about the possible values of a and c ?

A, $a = 3, c = -2$

B, $a = -2c-1, c = -1$

C, $a = -2c-1, c = 1$

D, $a = -2c-1, c$ any real number.

25, Let $f(x) = \frac{x}{x^2+4}$, then which of the following is always true?

A, $[-2, 2]$

B, It concave up on $(-\infty, -2\sqrt{3}] \cup [0, 2\sqrt{3}]$

26, Let $f(x) = x^5 - 5x^4 + 2$, then what is the range of $f(x)$ on $[-1, 2]$ -----?

A, $[-254, 2]$

B, $[-4, 2]$

C, $[-46, 2]$

D, $[-46, -4]$

27, What is the minimum distance between the parabola $y = x^2 + 1$ and the point $(0, 2)$? (unit)

A, $\sqrt{3}$

B, $\frac{1}{\sqrt{2}}$

C, $\frac{\sqrt{3}}{2}$

D, $\frac{2}{\sqrt{3}}$

28, Let $F(x) = \frac{x}{e^x}$, then $F^{n+1}(0) =$ -----? Assume n is odd

A, $n+1$

B, $-n-1$

C, $n-1$

D, $-n+1$

29. What is the area of the largest rectangle that can be inscribed in a circle of radius 10 unit ? in sq. unit.

- A. 800 B, 600 C, 400 D, 200

30. The rate of a certain chemical reaction is given by $f(x) = kx(a-x)$ for $0 \leq x, a > 0 \wedge k > 0$ for what value of x does the rate of the reaction increase?

- A, $0 \leq x \leq \frac{a}{2}$ B, $\frac{a}{2} \leq x \leq a$ C, $-\infty < x \leq \frac{a}{2}$ D, $\frac{a}{2} \leq x \leq 3a/4$

31. Which of the following is the general solution set of $\tan x = \sqrt{3}$?

- A. $\{\frac{\pi}{6} + n\pi; n \in \mathbb{Z}\}$ C. $\{\frac{\pi}{3} + n\pi; n \in \mathbb{Z}\}$
B. $\{\frac{\pi}{3} + 2n\pi; n \in \mathbb{Z}\}$ D. $\{\frac{\pi}{6} + 2n\pi; n \in \mathbb{Z}\}$

32. Which of the following is the solution set of the equation $\sin 5x = \frac{1}{2}$

- A. $\{\frac{\pi}{30} + \frac{2}{5}n\pi, \frac{\pi}{6} + \frac{2}{5}n\pi; n \in \mathbb{Z}\}$ C. $\{\frac{\pi}{30} + 2n\pi, \frac{\pi}{6} + 2n\pi; n \in \mathbb{Z}\}$
B. $\{\frac{\pi}{6} + \frac{2n\pi}{5}, \frac{5\pi}{6} + \frac{2n\pi}{5}; n \in \mathbb{Z}\}$ D. $\{\frac{\pi}{6} + 10n\pi, \frac{5\pi}{6} + 10n\pi; n \in \mathbb{Z}\}$

33. If $\cos \theta = \frac{\sqrt{3}}{2}$, then the general solution is

- A. $2n\pi$ B. $2n\pi$ C. $2n\pi + \frac{\pi}{3}$ D. $2n\pi + \frac{\pi}{6}$

34. The graph of the function $f(x) = \cos(3x - \frac{\pi}{3})$ has period

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

35. $\frac{\cos(-x)}{-\sin(-x)} =$ _____

- A. $\cot x$ B. $-\tan x$ C. $\cos x$ D. $-\cot x$

36. The modulus of $12 + 5i$ is

- A. 17 B. 13 C. 60 D. 7

37. The conjugate of $2i - 3$ is

- A. $2i + 3$ B. $3 - 2i$ C. $-3 - 2i$ D. $-3 + 2i$

38. $\frac{5-2i}{3+4i}$ is equal to:

- A. $\frac{7-26i}{25}$ B. $\frac{23-26i}{25}$ C. $\frac{3-4i}{5+2i}$
D. $\frac{5+2i}{7}$

39. $\sqrt{-2} + 2\sqrt{-18} + \sqrt{-50}$ is equal to

- A. $2\sqrt{22}i$ B. $2\sqrt{70}i$ C. $36\sqrt{2}i$ D. $12\sqrt{2}i$

40. The standard form of $\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}$ is = _____

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

41. In how many way can a group of 5 student be selected from a group of 12 students?

- A. 8568 B. 400 C. 792 D. 600
42. If a coin is tossed and a die is rolled what is the probability of the coin shows head and the die shows number 5.
- A. $\frac{1}{2}$ B. $\frac{1}{12}$ C. $\frac{1}{6}$ D. none
43. In a box of similar red and blue pens there are 3 red and 2 blue pens. If two pens are selected at random, what is the probability that all are red pens?
- A. $\frac{3}{10}$ B. $2\frac{1}{10}$ C. $\frac{4}{10}$ D. $\frac{6}{10}$
44. Given data: 12,15,14,11,18,16,14,12,16,12 the median of the data
- A. 15.5 B. 14.5 C. 14 D. 12
- Given below is the frequency distribution of population function V.

V	-3	-1	1	2	3
F	20	10	5	10	5

45. The mean of the distribution is _____
- A. -2 B. -1.5 C. -1 D. -0.6
46. The image of (-2,3) in reflecting about the line $x = -1$ is
- A. (0,3) B. (-1,2) C. (1,0) D. (1,3)
47. The reflection of circle $(x-2)^2 + y^2 = 5$ in the line $y = -x$ is
- A. $x^2 + y^2 + 4x = 1$ B. $x^2 + y^2 - 4x = 1$ C. $x^2 + y^2 - 4y = 1$ D. $x^2 + y^2 + 4y = 1$
48. A translation T. takes (1,-3) to (-1,0) then where does T takes (0,0)?
- A. (0,0) B. (-3,-1) C. (-2,3) D. $(0, -\frac{3}{2})$
49. Equation of image of circle $x^2 + y^2 - 4x - 6y + 9 = 0$ after reflecting through line $l: y = x + 3$ is _____
- A. $(x-1)^2 + (y-4)^2 = 4$ C. $x^2 + y^2 - 10y + 21 = 0$
- B. $(x-2)^2 + (y-4)^2 = 0$ D. $x^2 + y^2 - 4x - 6y + 9 = 0$
50. If $\begin{vmatrix} x & 1 & -1 \\ -1 & \frac{1}{x} & 0 \\ 2 & 0 & -1 \end{vmatrix} = 4$ then what is the value of x?
- A. 2 B. $\frac{1}{2}$ C. $\frac{1}{3}$ D. 3
51. If $(x \ 1) \begin{pmatrix} 1 & -x \\ 2 & 5 \end{pmatrix} \begin{pmatrix} 1 \\ 2-x \end{pmatrix} = 4$ then which one of the following is the value of x?
- A. {-2,2} B. {1,2} C. {-2,-1} D. {1,-1}
52. Which one of the following is equal to $\begin{vmatrix} a & b & c \\ 1 & -1 & 1 \\ a+b & a+c & b+c \end{vmatrix}$
- A. abc B. $C^2 - a^2$ C. $a^2 + b^2 + c^2$ D. $a + b + c$

53. The composition of g by f denoted by
 A. $fog(x)$ B. $gof(x)$ C. $gog(x)$ D. $fof(x)$
54. $F(x) = \lfloor x \rfloor$ the range of $f(x)$ is the set of all _____
 A. R B. Z C. W D. N
55. Let $f: R \rightarrow R$ be given by $f(x) = x^2$ which of the following is true about $f(x)$
 A. It is one to one C. it is on to
 B. it is function D. it is one to one correspondence
56. Which of the following is not inverse of each other
 A. $f: R \rightarrow (0, \infty): f(x) = 2^x \wedge g: (0, \infty) \rightarrow R: g(x) = \log_2 x$
 B. $F(x) = \frac{x+1}{x+2}, x \neq -2 \wedge g(x) = \frac{1-2x}{x-1}, x \neq 1$
 C. $f(x) = \frac{x+5}{x+1}, x \neq -1 \wedge g(x) = \frac{5-x}{x+2}, x \neq -2$ D. None
57. Which of the following is not rational function?
 A. $f(x) = \frac{3x-1}{4x^2-1}$ B. $f(x) = \frac{1}{x}$ C. $f(x) = \frac{\sqrt{x^2+1}}{7x-1}$ D. none
58. What is the solution of $\frac{x-6}{x} + \frac{x+4}{x} + 1$
 A. -10 B. $\emptyset$ C. 3 D. 5
59. In the graph of rational function $f(x) = \frac{N(x)}{D(x)}$, if the degree of $N(x) \leq$ degree of $D(x)$ the graph has _____ asymptote
 A. Vertical B. oblique C. horizontal D. none
60. What is the equation of the directrix of $x^2 = 16y$
 A. $y = 4$ B. $y = -4$ C. $x = 4$ D. $x = -4$
61. What is the eccentricity of $\frac{x^2}{16} + \frac{y^2}{9} = 1$
 A. $\frac{2}{3}$ B. $\frac{\sqrt{2}}{4}$ C. $\frac{2\sqrt{2}}{3}$ D. $\frac{1}{2}$
62. What is the eccentricity of $16x^2 - 9y^2 = 144$?
 A. $\frac{5}{4}$ B. $\frac{4}{5}$ C. $\frac{5}{3}$ D. $\frac{3}{5}$
63. Which one of the following is not a tautology?
 A. $P \Rightarrow (p \vee q)$ B. $(PP \wedge q)$
 C. $(Pq) \Leftrightarrow (\neg q \Rightarrow p)$ D. $(p \Rightarrow q) \Leftrightarrow (p \vee q)$
64. If " P " stands for $\sqrt{2}$ is an irrational number and q stands for 2 is an odd number then which of the following has truth value "true"?
 A. $P \Rightarrow q$ B. $\neg p \vee q$ C. $p \wedge q$ D. $\neg q \Leftrightarrow p$
65. If the propositional statements p and q are T and r is F which of the following compound proposition has truth value F?
 A. $(p \Rightarrow q) \Rightarrow r$ B. $(p \vee r) \Rightarrow q$ C. $(p \wedge r) \Rightarrow p$ D. $(q \vee p) \Leftrightarrow \neg r$

