CAT - 2019 MATHEMATICS PG

- 1. Let $A = (a_{ij})$ be a matrix of order $m \times n$, where $a_{ij} = 1$ for all *i, j*. Then *rank*(A) is et $A = (a_{ij})$ be a matrix of order $m \times n$, where $a_{ij} = 1$ for all *i, j.* \dots or eank(

(A) m

(B) $m - n$

(C) 1

(C) 0

(A) $c \ne 0$ and $a = b$

(B) $c \ne 0$ and $a \ne b$

(C) $a \ne b$

(D) $a = b = c = 0$

(D) $a = b$

(D) $a = b$ Let $A = (a_i)$ be a matrix of order $m \times n$, where $a_i = 1$ for all $i, j, m \times m$ rank(A) is

(A) m

(B) $m - n$

(D) 0

(D) 0

(D) 0

(D) 0

(A) $\le x \times 0$ and $a \ne b$

(C) $a \ne b$

(C) $a \ne b$

(D) $a = b = c \le 0$

(D) $a = b$
 1. Let $A = (a_{ij})$ be a matrix of order $m \times n$, wh

(A) m

(B) $m - n$

(C) 1

(D) 0

(D) 0

2. The vectors $(a, b, 0)$, $(1, 0, c)$ and $(1, 1, 0)$

(A) $c \neq 0$ and $a = b$

(B) $c \neq 0$ and $a \neq b$

(C) $a \neq b$
	- (A) *m*
	- (B) *m n* (C) 1
	- (D) 0

2. The vectors $(a, b, 0)$, $(1, 0, C)$ and $(1, 1, 0)$ are linearly independent in \mathbb{R}^3 if

- (A) $c \neq 0$ and $a = b$
- (B) $c \neq 0$ and $a \neq b$
- (C)
- (D)
- 3. The number of non-trivial subspaces of \mathbb{R}^3 over \mathbb{R} is
	- (A) 0
	- (B) infinite
	- (C) 3 (D) 6

4. If $\sqrt{x^2 + 6x}$ /27 > 0 and $x^2 - 3x - 4 < 0$, then Anon-trivial subspaces of R' over R is
 $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ and $x^2 - 3x - 4 < 0$, then
 $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$

- (A)
- (B) $x < 4$
- (C) $3 < x < 4$
- $\frac{7}{2}$ (D)
- 5. The area enclosed within the curve $|x| + |y| = 1$ is
- (A) 2 sq units
- (B) 4 sq units
- (C) 6 sq units
- (D) 8 sq units

6. If the point P(4, 3) is shifted by a distance $\sqrt{2}$ unit parallel to the line $x = x$, then the coordinates of P in the new position is

\n- (B) 4 sq units
\n- (C) 6 sq units
\n- (D) 8 sq units
\n- (D) 8 sq units
\n
\n6. If the point P(4, 3) is shifted by a distance
$$
\sim
$$
 coordinates of P in the new position is

\n\n- (A) $(-5, -4)$
\n- (B) $(5 + \sqrt{2}, 4 + \sqrt{2})$
\n- (C) $(5 - \sqrt{2}, 4 - \sqrt{2})$
\n- (D) $(5, 4)$
\n- (E) $5x - 12y + 10 = 0$ and $12y - 5x + 16 = 0$ are the circle is
\n

- If $5x 12y + 10 = 0$ and $12y 5x 10 = 0$ are two tangents to a circle, then the radius of the circle is The point P(4, 3) is shifted by a distance $\sqrt{2}$ unit parallel to the unit of P in the new position is

(A) (-5, -4)

(B) $(5 + \sqrt{2}, 4 + \sqrt{2})$

(C) $(5 - \sqrt{2}, 4 - \sqrt{2})$

(D) $(5, 4)$
 $-5x - 12y + 10 = 0$ and $12y - 5x - 16 = 0$ If the point P(4, 3) is shifted by a distance $\sqrt{2}$ unit parallel to the number of $\sqrt{2}$ then the coordinates of P in the new position is

(A) (-5, -4)

(B) $(s+\sqrt{2}, 4+\sqrt{2})$

(D) (5, 4)

If $5x-12y+10=0$ and $12y-5x-10$
	- (A) 1
	- (B) 2
	- (C) 4
	- $(D) 5$
- 8. The locus of the enters of the circles which touch both the axes is given by of the circles which touch both the axes is given by

COMMON ADMISSION

(A)
$$
x^2 - y = 0
$$

\n(B) $x^2 + y = 0$
\n(C) $y^2 - y^2 = 1$
\n(D) $x^2 + y^2 = 1$

- 9. If $3^{x+1} = 6^{\log_2 3}$, then *x* is
	- $(A) 3$
 $(B) 2$
	- (B)
	- (C) $log_3 2$
	- (D) $\log_2 3$

11. The equation $|z+1-i|=|z+i-1|$ represents a

- (A) pair of straight lines
- (B) circle
(C) parabo
- parabola

(A)

 (B)

(B) $\frac{5}{12}$
(C) $\frac{5}{2}$

(D) 625

(D) hyperbola

12. The radius of the circle $|z + i|$ is equal to 11. The equation $\begin{bmatrix} 1 & 1 \end{bmatrix}$ (A) pair of straight lines

(B) circle

(C) parabola

(D) hyperbola

12. The radius of the circle $\begin{bmatrix} z-i \\ z+i \end{bmatrix} = 5$ is equal to

(A) $\frac{13}{12}$

(C) $\frac{5}{12}$

(C) 5

(D) 625

- 13. The sum of the series $(1 + 2 + 2) + (1 + 2 + 2^2) + (1 2 + 2^2 + 2^3) + ...$ up to *n* terms is (b) hyperbola

(b) hyperbola

He radius of the circle $\left|\frac{z-1}{z+i}\right| = 5$

(c) 5

(c) 5

(b) 625

He sum of the series $(z+2)$ + $(1 + 2 + 2^2) + (1 - 2 + 2^2 + 2^2) + ...$ up to *n* ter

(A) $2^{z+2} - n = 4$

(B) $2^{(2^z-1)} + n$

(C) $2^{$ (b) hyperbols

The radius of the circle $\frac{1}{2}$ + i] = 5

(c) $\frac{13}{2}$

(d) $\frac{13}{2}$

(d) $\frac{13}{2}$

(d) $\frac{13}{2}$

The sum of the series $\frac{13}{2}$

(e) $\frac{5}{2}$

(h) $\frac{5}{2}$

(c) $\frac{5}{2}$

(h) $\frac{25}{2}$

(h
	- (A)
	- (B)
	- (C)
	- (D)
- 14. $\cdot \cdot \cdot \cdot \cdot$ is equal to 2²³² - 11 - 11

2²³² - 11 - 12

2²³² - 11

2²³² - 11

2²³² - 11

2²³² - 12

2²³² - 12

2²³² - 12

2²³ - 12

2²³ - 12

2²³ - 12

2²³ - 12

2²³
	- (A)
	- (B)
	- (C) $x \cot \frac{x}{2} + c$
	- (D) $\log(x + \sin x)$

- 15. The solution of the differential equation is $\cos x dy = y(\sin x y)dx, 0 < x < \frac{\pi}{2}$, is
- - (A)
	- (B) $y \sec x = \tan x + c$
	- (C)
	- (D)

16. The integrating factor of the differential equation is $\log y)dx = (\log^4 y - x)dy$ is 15. The solution of the differential equation

(A) $sec x = tan x + c$

(B) $y sec x = tan x + c$

(C) $y tan x = sec x + c$

(D) $tan x = (sec x + c)y$

16. The integrating factor of the differential equation

(A) $\frac{1}{log y}$

(B) $log(log y)$

(C) $1 + log y$

- (A)
- (B)
- (C)
- (D) log *y*
- 17. The number of distinct real values of \leftrightarrow , for which the vectors $-\lambda^2 \hat{i} + \hat{j} + \hat{k}, \hat{k}$ and $i + j - \lambda^2 k$ are coppension, is (B) $y \sec x = \tan x + c$

(C) $y \tan x = \sec x + c$

(D) $\tan x = (\sec x + c)y$

(D) $\tan x = (\sec x + c)y$

(he integrating factor of the differential eq. vion (b) $\log y$) $dx = (\frac{1}{100}y - x) dy$

(B) $\log(\log y)$

(C) $1 + \log y$

(D) $\log y$

(D) $\log y$

(D) $\log y$

(D) $\$ (B) $y \sec x = \tan x + c$

(C) $y \tan x = \sec x + c$

(D) $\tan x = (\sec \sqrt{x} + c)y$

The integrating factor of the differential equation (b) $\frac{x}{2}ydx = (\sec x + x)dx$ is

(A) $\frac{1}{\log y}$

(B) $\log(\log y)$

(C) $1 + \log y$

(D) $\log y$

The mun are of distinct real s Custinet real values on $\frac{1}{2}$. $\frac{1}{2}$ and $\frac{1}{2}$ and $\frac{1}{2}$ are eq. $\frac{1}{2}$ and $\frac{1}{2}$ are eq. $\frac{1}{2}$ and $\frac{1}{2}$ are eq. $\frac{$
	- (A) 0
	- (B) 1 (C) 2
	- (D) 3

18. If a, b, c are three non-coplanar mutually perpendicular unit vectors, then $\begin{bmatrix} a & b & c \end{bmatrix}$ is

- $(A) 2$
- (B) 0
- (C) 1
- (D) 3

19. If
$$
x^2y^2 = 100
$$
, then $\frac{dy}{dx}$ is equal to
\n(A) $-\frac{y(x+y)\log x}{x(x\log y+y)}$
\n(B) $-\frac{y(y+x)\log x}{x(y\log x+y)}dx$
\n(C) $-\frac{y}{x} \int_{x}^{x} \sqrt{y^2 \log x + y^2} dx$
\n(D) $-\frac{y}{x} \int_{x}^{x} \sqrt{y^2 \log x + y^2} dx$
\n50. If $\sec^{-1}(\frac{1+x}{1-y}) = a$, then $\frac{dy}{dx}$ is
\n(A) $\frac{y+1}{x+1}$
\n(B) $\frac{y+1}{x+1}$
\n(C) $\frac{x-1}{x+1}$
\n(D) $\frac{x+1}{x+1}$
\n(E) $\frac{dy}{dx}$
\n(E) \frac

(c)
$$
\frac{1 + \log z}{1 + \log x}
$$

\n(d) $\frac{1 - \log z}{1 - \log x}$
\n22. If $f : R = R$ is defined by $f(x) = x - [x] = \frac{1}{2}$ for $x \in R$ w, $xe [x]$ is the great set in 'eger not exceeding x, then the set $\{x \in R : f(x) = \frac{1}{2}\}$ (a equal to (c)) 2. The set of all natural numbers
\n(d) 1
\n(e) 0, the empty set
\n(f) 1
\n(g) 1
\n(h) 1
\n(i) 1
\n(j) 0
\n(k) 1
\n(l) 0
\n(l) 1
\n(l) 0
\n(m) 0
\n(n) 1
\n(o) 1
\n(o) 0
\n(o) 1
\n(o) 1
\n(o) 2
\n(o) 2
\n(o) 1
\n(o) 2
\n(o) 2
\n(o) 1
\n(o) 2
\n(p) 3
\n(c) 1
\n(d) 1
\n(e) 2x² + 9x² + 2x² is decreasing function of x in the largest possible interval
\n(-2,-1), then the value of + is equal to

25. If $I(x) = 2x + 9x + 6x + 20$ is decreasing function of x in the largest possible interval , then the value of \neq is equal to

- (A) 12
- $(B) 12$
- (C) 6
- (D) -6

26. The maximum sum of the series $20 + 19^{\frac{1}{3} + 18^{\frac{2}{3}} + 18^{\frac{1}{3}} + \dots}$ is D) - 6

he maximum sum of the series 20 + 19 $\frac{1}{3}$ + 18 $\frac{2}{3}$ + 18 +

(A) 310

(B) 290

(C) 320

(D) 360

he product (32) (32 $\frac{1}{3}$ (32) $\frac{3}{2}$ is equal to

(A) 16

(D) 34

(C) 32

(C) 32

(C) 32

(B) 64

((D) - 6

The maximum sum of the series 20 + 19 $\frac{1}{3}$ + 18 $\frac{2}{3}$ + 18 + 18

(A) 310

(C) 320

(D) 360

The product (32)⁽³²⁾²/32)⁵ is equal to

(A) 16

(D) 32

(D) 32

The sum of 20 text, s of the series $\sqrt{2$ (B) -12

(C) 6

(D) -6

26. The maximum sum of the series $20 + 19^{\frac{1}{3}} +$

(A) 310

(C) 220

(C) 320

(D) 360

- $(A) 310$
- (B) 290
- (C) 320
- (D) 360

27. The product $(32)^{(32)^{\frac{1}{36}}(32)^{\frac{1}{36}}}$ is equal to

- (A) 16
- (B) 64
- $(C) 32⁴$ (D) 0

28. The sum of 20 te.t. $\sqrt{2}$ the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + ...$ is equal to

- (A) 210 (2) 220 (C) 300 $\sqrt{2}$
- (D) $320\sqrt{2}$
- 29. If $x^2 3x + 2$ is one of the factors of the expression $x^4 px^2 + q$, then (A) $p = 4, q = 5$ E.n. s of lie series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + ...$ is equal to

cut, s of lie series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + ...$ is equal to

one of the factors of the expression $x^4 - px^2 + q$, then
- (B) $p = -5, q = -4$
- (C) $p = 5$, $q = 4$
- (D) $p = -5, q = 4$

(c)
$$
p = 5, q = 4
$$

\n(d) $p = -5, q = 4$
\n(e) $p = 5, q = 4$
\n30. If $x = 2 + 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$, then the value of $x^3 - 6x^2 + 6x$ is
\n(A) 3
\n(B) 2
\n(C) 4
\n(D) 4
\n3
\n5
\n6
\n6
\n6
\n6
\n7
\n $\frac{p}{2}$
\n \frac

.

.

(A) 3 (B) 2 (C) (D)

$$
\sum_{r=1}^{n} \frac{P_{r+1}}{a} = \frac{P_r}{b} = \frac{P_{r+1}}{c}
$$
, then

- (A) (B) $abc =$ (C) x = 2 + 2² + 2² (then the value of x² - 0x² + 0x is

(A) 3

(C) 2

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(D) 4

(A) $\sum_{a}^{1} = \frac{P}{b} = \frac{P_{x+1}}{c}$, then

(B) abc = 1

(C) $b' = a(b+c)$

(C) $b' = a(b+c)$
- (L)
- 32. The number of numbers greater than 1000 but not greater than 4000 that can be formed with μ , digit $(0,1,2,3,4)$, repetition of digits being allowed, is If $x = 2 + 2^{\frac{1}{2}} + 2^{\frac{3}{2}}$ (Seen the value of $x^2 - 0x^2 + 0x$ is

(A) $\frac{10}{100}$ 2

(C) $\frac{10}{100}$ 2

If $\frac{v_{n-1}}{a} = \frac{v_n}{b} = \frac{v_{n-1}}{c}$, then

(A) $\sum \frac{1}{a} = 1$

(B) $abc = 1$

(C) $\frac{b^2 - a(b) + C}{c^2 + b^2}$

(D + B

+ B

+ B

m... abest greater than 1000 but not greater than 4000 that can be formed

21, 2, 3, 4, repetition of digits being allowed, is

divisors of the form $+ n + 2(n \ge 0)$ of the integer 240 is
	- (A) 374 (B) 375 (C) 376 (D) 377
- 33. The number of divisors of the form $4n + 2(n \ge 0)$ of the integer 240 is
	- (A) 4
	- (B) 8
(C) 10
	- (C)
	- (D) 3

34. The coefficient of x° in $(x^{\circ}+x^{\circ})$ is (A) (B) (C) (D) The solution set of the equation determinant of the matrix $\begin{bmatrix} 0 & 7 & 3 \end{bmatrix} = 0$ is (A) \hat{M} $(B) \{0, 1\}$ $(C) \{1, -1\}$ (D) $\{1, -3\}$ 36. The system of linear equations $x_1 + 2x_2 + x_3 = 3$, $2x_1 + 3x_2 + x_3 = 3$ and $3x + 5x_2$ has (A) infinite number of solutions (B) exactly \degree solutions (C) ∂ un que solution (D) no solution 37. If the matrix $\begin{bmatrix} c & d \end{bmatrix}$ is commutative with the matrix $\begin{bmatrix} 0 & 1 \end{bmatrix}$, then (A) (B) (C) (D) $d = 0, a = b$ (A) $(C_0 + C_4 - 1)$

(C) $C_0 - 1$

(C) $(C_0 - 1)$

(C) $(C_0 - 1)$

(C) $(C_1 - 1)$

(C) $(C_2 - 1)$

(C) $(C_1 - 1)$

(C) $(C_2 - 1)$

(C) $(C_1 - 1)$

(A) β

(B) β , β

(D) $\{1, -3\}$

(D) $\{1, -3\}$

(D) $\{1, -3\}$

(E) $\{1,$ (B) ${}^{16}C_1$ ${}^{16}C_2$

(B) ${}^{16}C_3$ ${}^{16}C_4$

(D) ${}^{16}C_5$

(D) ${}^{16}C_2$

(D) ${}^{16}C_3$

(D) ${}^{16}C_2$

(D) ${}^{16}C_3$

(D) ${}^{16}C_1$

(D) ${}^{16}C_2$

(D) ${}^{16}C_3$

(B) ${}^{16}C_1$

(B) ${}^{16}C_2$

(D) ${}^{$ mear equations $x_1 + 2x_2 + x_3 = 3$, $2x_1 + 3x_2 + x_3 = 3$ and $3x_1 + 5x_2 + 2x_3 = 1$

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on
 $\begin{bmatrix} b \\ d \end{bmatrix}$ is commutative with the matrix $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then
 $=c$
 $= d$
 $= e$
 $= e$ 34. The coefficient of x^6 in $(1+x)^6 + (1+x)^6 +$

(A) ¹⁶C₀

(B) ¹⁶C₂ - ⁶C₂

(C) ¹⁶C₂ - 1 (C) ¹⁶C₂ - 2 (C) (C) ¹⁶C₂ - 2 (C) (C) ¹⁶C₂ - 2 (C) (C) (C) (C) (C) (C) (C) C₂ (C) (C) (C) (C) (C) (C) (C

38. If
$$
\cos^2 \alpha = \csc^2 \sin \alpha
$$
 and $\sin^2 \alpha$ and $\cos^2 \beta = \cos^2 \beta = \csc^2 \beta$ and $\sin^2 \beta$ are two matrices such that *AB* is a null matrix, then $(\frac{a^2}{a^2})^B$ is
\n(A) 0
\n(B) an odd multiple of $\frac{\pi}{2}$
\n(C) $\frac{\pi}{\sqrt{2}} = \sec^2 \alpha$
\n(D) $\frac{\pi}{\sqrt{2}} + e$
\n(E) $\frac{\pi}{\sqrt{2}} + e$
\n

- (A)
- (B)
- (C)
- (D) \hat{M}

42. If *R* is a relation over the set all real numbers and it is defined by $m \ge 0$, then *R* is (B) $\{1, -1, i, -i\}$

(C) $\{i, -i\}$

(D) \hat{m}

42. If *R* is a relation ever the set all real number

(A) reflexive and transitive

(B) reflexive and symmetric

(C) symmetric and transitive

(D) an equivalence relation

- (A) reflexive and transitive
- (B) reflexive and symmetric
- (C) symmetric and transitive
- (D) an equivalence relation

Let $f : \mathbb{R} \to \mathbb{R}$ be the mapping lefined by $f(x) = x^2 + \sum_{x \in \mathbb{R}^n} f(x)$ is

- (A) bijective
- (B) surjective
- (C) injective
- (D) automorphism

44. Let $a, b, c \in N$ and b, c be coprime. If $aN = \{an : n \in N\}$ and $bN \cap cN = dN$ then (B) θ

(B) θ

(B) reflexive and transitive

(B) reflexive and transitive

(B) reflexive and symmetric

(C) symmetric and symmetric

(C) symmetric and transitive

(D) and pointing in the property of the mapping left
 (D) θ

If R is a relation ever the set all real numbers and it is d-fin A by $m \ge 0$, then R is

(A) reflexive and transitive

(B) enterior and transitive

(D) an equivalence relation

Let $f: \mathbb{R} \to \mathbb{R}$ be the map Paism

Pand b, c be optime. If $aN = \{an : n \in N\}$ and $bN \cap cN = dN$ then

onto mappings from the second of $\{1, 2, ..., m\}$ in to the set $Y = \{1, 2\}$ is

- (A)
	- (B)
	- (C) (D)

45. The number of onto mappings from the set $\{1, 2, ..., m\}$ in to the set $Y = \{1, 2\}$ is

- (A) m – 2
- (B) *m*
- (C) $^{m-1}$ – 2
- (D) 2*m*
- 46. If the probability of a defective bolt is 0.1, then the mean and the standard deviation of distribution of bolts in a total of 400 are
	- (A) 30, 3
	- (B) 40, 5
	- (C) 30, 4
	- (D) 40, 6
- 47. A committee of five is to be chosen from a group of 9 people. The probability that a certain married couple will either serve together or not at . Il is distribution of bolts in a total of 400 are

(A) 30, 3

(B) 40, 5

(C) 30, 4

(D) 40, 6

47. A committee of five is to be chosen from a g

certain married couple will either serve toge

(A) $\frac{1}{\sqrt{2}}$

(C) $\frac{4}{9}$
	- (D)

(A)

 (B)

(C)

48. Seven balls are drawn simultaneously from a bag containing 5 white and 6 green balls. The probability of drawing 3 white and 4 green balls is CO 30, 4

CO 40, 6

committee of five is to be chosen from a group of 9 prop¹s. The probability

CD $\frac{4}{9}$

CO $\frac{4}{9}$

CD $\frac{2}{3}$

even ba¹s are frawn simu (tapenous), from a bag containing 5 white and 6 g

th

49. A biased coin with probability $p_i^{(0 \lt p \lt 1)}$ of heads is tossed until a head appears for

the first time. If the probability that the number of tosses required is even is $\frac{1}{5}$, then *p* is equal to

(A) (B) (C) (D) (A) $\frac{1}{3}$

(B) $\frac{2}{3}$

(C) $\frac{3}{5}$

Thich of the following an abers is rational?

(A) sin 15

(C) sin 15.84 cos 15.64

(D) sin 15.84 cos (A) $\frac{1}{3}$

(B) $\frac{2}{3}$

(B) $\frac{3}{5}$

Which of the following and sbers is rational?

(A) $\sin 15^{\circ}$

(B) $\cos 15^{\circ}$

(D) $\sin 15$ 49. A biased com while probability that the nur
equal to
(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{2}{5}$
(C) $\frac{2}{5}$
50. Which of the following : a bers is rational?

50. Which of the following numbers is rational?

- (A)
- (B) cos $15\mathbf{\hat{h}}$.
- (C) sin $15\frac{3}{2}$ cos $15\frac{2}{2}$
- (D) sh $15 \nightharpoonup$ cos $75 \nightharpoonup$

51. The equation $\sqrt{3} \sin x + \cos x = 4$ has

- (A) only C_1 solution
- (B) t_{rv} solutions
- (C) infinitely many solutions
- (D) no solutions

52. The equation $x^2 + y^2 + 4x + 6y + 13 = 0$ represents cos 15 fm

cos 15 fm

3os 75 fm

3 sin. + cos x = 4 has

colution

common solutions
 $x^2 + y^2 + 4x + 0y + 13 = 0$

represents

two distinct straight line

coincident straight line

coincident straight line

- (A) circle
- (B) a pair of two distinct straight line
- (C) a point
- (D) a pair of coincident straight line
- 53. In the interval $(-3,3)$, the function $\frac{f(x)}{x^3} + \frac{3}{x}, x \neq 0$ is 53. In the interval (-3,3), the function $f(x)$

(A) increasing

(B) decreasing

(C) neither increasing not decreasing

(D) partly increasing and partly decreasing

54. Let G be a group of even order with identity

(A) $a^$
	- (A) increasing
	- (B) decreasing
	- (C) neither increasing nor decreasing
	- (D) partly increasing and partly decreasing

54. Let *G* be a group of even order with identity element e . Then CUSAT CONTROL CONTROL CONTROL CONTROL CONTROL CONTROL CONTROL CONTROL COMMON CONTROL COMMON CONTROL C

(A) $a^2 \geq e^x$ for some $a \in G$

$$
(B) \Omega^3 = e \text{ for some } a \in G
$$

- (C) $a^{O(G)} = e$ for some $a \in G$
- (D) $a^{O(G)} = e$ for no $a \in g$
- 55. If every element of a g₁ \vee ⁿ *G* is its own inverse, then *G* is
	- (A) abelian
	- (B) infinite
	- (C) c_y lic
	- (D) finite
- 56. The set of congruent 8 classes [1], [3], [5], [7] under multiplication modulo 8 forms (C) neither increasing and partly decreasing

(D) partly increasing and partly decreasing

Let G be a group of even order with identity element e. The

(A) $a^2 \neq$ for some $a \in G$

(B) $a^{2n\omega} = c$ for some $a \in G$

(C) a
	- (A) 2 cy ^tic group
	- (B) a monoid
	- (C) an *b*-clian group
	- (D) the Klein four group
- 57. Consider the group $(Q^*,*)$ where Q^* is the set of all positive relational numbers and to fa g_L m *G* is its own inverse, then *G* is

run. 8 casses [1], [3], [5], [7] under multiplication modulo 8 forms

group

in group

oup (*Q'*, *) where Q^* is the set of all positive relational numbers and
 $a * b = \frac$

* is defined by $a * b = \frac{av}{2}$, $a, b \in \mathbb{R}$. Then the inverse of 3 is

- (A) $1/3$
- (B) $3/4$

58. The generators of the cyclic group $G = \begin{bmatrix} S^n & n \in \mathbb{Z} \end{bmatrix}$ are (A) 2 and $\frac{1}{2}$ (B) 4 and $\frac{1}{4}$ (C) 6 and (D) $\overline{8}$ and $\overline{8}$ 59. The number of points on the circle $3x^2 + 2y^2 - 3x = 0$ which are at distance 2 from the point $(-2, 1)$ is (A) 2 (B) 0 (C) 1
(D) 3 (D) 60. Let $= 2^{\frac{5}{2}} + 2^{\frac{5}{2}}$. Then $= 0$ is equal to (A) (B) (C) (D) 1 61. If $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ and a, b, c are in geometrical progression, then x, y, z are in (A) AP (B) 4 and $\frac{1}{4}$

CO 6 and $\frac{1}{8}$

CO $\frac{1}{8}$ and $\frac{1}{8}$

he number of points on the cir. le $3x^2 + 2y^2 - 3x = 0$ which are at distance 2

CO $\frac{1}{2}$

CO $\frac{1}{1}$

CO $\frac{1}{1}$

CO $\frac{1}{1}$

CO $\frac{1}{3}$ (B) $4 \text{ and } \frac{1}{4}$

(C) $6 \text{ and } \frac{1}{8}$

(C) $6 \text{ and } \frac{1}{8}$

(D) $8 \text{ and } 8$

The number of points on the circ le $3x^2 + 2y^2 - 3x = 0$ which are at distance 2 from the

point (-2, 1) is

(A) 2

Let $\left(\frac{3}{2}, \frac{y^2 - 1}{2$ The Terms is equal to
 $\frac{1}{20}$

and a, b, c are in geometrical progression, then x, y, z are in
 \bigcirc \bigcirc 58. The generators of the cyclic group

(A) 2 and $\frac{1}{2}$

(B) 4 and $\frac{1}{4}$

(C) 6 and $\frac{1}{8}$

(D) $\frac{1}{8}$ and $\frac{1}{8}$

(B) $\frac{1}{8}$

8 and $\frac{1}{8}$

point (-2, 1) is

(A) 2

- (B) GP
- (C) HP
- (D)
- 62. The interior angles of a polygon are in AP. The smallest angle in 120 \hat{m} and the common difference is $5\frac{2}{3}$. The number of sides of the polygon is the interior angles of a polygon are in AP. The smallest angie 1: 120 Fm and the interior is 5 Fm The number of sides of the polygon is

(A) 9

CC 16

CC 3 Fm 10

CC 3 Fm 10

COMMON

COMMON

COMMON

COMMON

COMMON

COMMON The interior angles of a polygon are in AP. The smallest angle. 1209 and the compon
difference is 59%. The number of sides of the polygon is
(A) 9
(C) $\frac{16}{9}$
(D) $\frac{1}{9}$
If $x + \frac{1}{x} = 5$, then $\left|x^2 + \frac{1}{x^3}\right| = 5$ (C) HP

(D) $a = b = c$

62. The interior angles of a polygon are in AP.

difference is 5 for The number of sides of th

(A) 9

(B) 10

(C) 16

(D) 5

(C) 16

(D) 5

(A) 0

(A) 0

(A) 0
	- $(A) 9$ (B) 10 (C) 16 (D) 5

63. If $x = \text{then } x^3$ $\begin{cases} x^3 & x^4 \end{cases}$ is equal to

- (A) 0
	-
	- (B) 5
	- (C)
	- $(D) 10$

64. If roots of the equation x^{\prime} = 0 are $(1, a_1, a_2, ..., a_{n-1})$, then the value of $\sqrt{(1-a_{n-1})}$ is q arion x and $\sum_{n=0}^{\infty}$ COMMON $\sum_{n=0}^$

(A) *n* (B) *n* \overline{n} (C) *n n* (L) 0

65. If $ax^2 + bx + 10 = 0$ does not have two distinct real roots, then the least value of $5a + b$ is

- $(A) -3$
- (B) -2
- (C) 3
- (D) 2

66. The roots of the equation $x^* = \sqrt{x}$ are 66. The roots of the equation $x^{\sqrt{x}} = \sqrt{x^3}$ are

(A) 0 and 4

(B) 0 and 1

(C) -1 and 4

(D) 1 and 4

(D) 1 and 4

(C) $\sqrt{x^3}$

CUSAT COMMON ADMISSION TEST 2019

- (A) 0 and 4
- (B) 0 and 1
- (C) -1 and 4 ED O TI and 4 SSLOW TO DEVELOP TO **B** oranta de Contras 2019
	- (D) 1 and 4

67. The total number of 9 digit numbers with different digits is

- (A) 10!
 (B) 9!
- (B)
- (C) 9.9!
- (D) 10.10!

68. If a, b, c are three natural numbers which are in AP and $a + b + c = 2$, then the possible number of values of the ordered triplet (a, b, c) is (b) 10.10!

(d, b, c are three natural numbers which are in AP and $a+b+c$) = $\frac{1}{2}$ then the

umber of values of the ordered triplet (a, b, c) is

(A) 15

(C) -13

(C (D) 10.10!

If a, b, c are three negative in anometers which are in AP and $a + b + c$ = $\frac{1}{2}$ then the c is

mumber of values of the ordered triplet (a, b, c) is

(A) 15

(B) 12

The digit at the unit place in the number (A) 10!

(B) 9!

(C) 9.9!

(D) 10.10!

68. If a,b,c are three natural numbers which are number of values of the ordered triplet (a, b)

(A) 15

(B) $\frac{14}{3}$

(C) 12

(D) 12

(A) 2

(A) 2

(A) 2

(B) 1

- (A) 15
- (B) 14
- (C) 13
- (D) 12

69. The digit at the unit place in the number $19^{2005} + 17^{2005} - 5^{2005}$ is

- (A) 2
- (B) 1
- (C) 0
- (D) 8
- 70. In the expansion of $\left\{\right.$ the constant term is
	- $(A) 20$
	- (B)
	- (C) Ω
	- (D)

71. For $|x| < 1$, the constant term in the expansion of $(x-1)^2(x-1)$ is CUSAT COMMUNIST 2019

- (A) 2
- (B) 1
- (C) 0

- 72. A survey shows that 63% of the Americans like cheese whereas 76% like apples. If $x\%$ of the Americans like both cheese and apples, then
	- (A) $x = 39$
	- (B) $x = 63$
	- (C)
	- (D)

73. If $P(A)=0.65, P(B)=0.80$, then $P(A \cap B)$ lies in the interval B) $x = 63$

C) $36 \le x \le 63$

D) $x \ne 39$
 $\therefore P(A) = 0.65, P(B) = 0.80$, then $P(A \cap B)$ lies in the interval

(A) [0.30, 0.80]

(B) [0.30, 0.80]

(C) [0.4.5, 0.65]

(C) $\frac{\sin(x+y)}{a-b} = \frac{a+b}{a-b}$, then $\frac{\tan y}{\sin y}$ is equation

(A (B) $x = 63$

(C) $36 \le x \le 63$

(D) $x \ne 39$

(B) $(0.30, 0.80]$

(B) $[0.35, 0.75]$

(B) $[0.35, 0.75]$

(D) $[0.45, 0.65]$

(D) $[0.45, 0.65]$
 $\text{If } \sin(x + y) = \frac{a+b}{a-b}$, $\text{then } \sin(y)$ is equal to $\text{or } \frac{1}{a}$

(C) $\frac{1}{a$

 (A) [0.30, 0.80] (B) [0.35, 0.75] (C) [0.4, 0.70] (D) [0.45, 0.65] of the Americans like both cheese and apple

(A) $x = 39$

(B) $x = 63$

(C) $36 \le x \le 63$

(D) $x \ne 39$

(D) $x \ne 39$

(D) $x = 39$

(D) $x \ne 39$

(C) $10.35, 0.75$

(C) $[0.30, 0.80]$

(B) $[0.35, 0.75]$

(C) $[0.4, 0.70]$

- 74. If $sin(x y)$ a b, then any is equal to
	- (A) 0
	- (B) *ab*

$$
(C) \frac{b}{a}
$$

- (D)
- 75. The value of $\cos 80^\circ$ $\sin 80^\circ$ is equal to $\frac{1}{\sqrt{100}}$, $\frac{1}{\sqrt{100}}$
	- - $\sqrt{2}$ (A)
		- $\sqrt{3}$ (B)
		- (C) 2
		- (D) 4

76. If
$$
y = f(x^2)
$$
, $z = g(x^2)$, $f'(x) = \tan x$ and $g'(x) = \sec x$, then the value of $\frac{dy}{dx}$ is
\n(A) $\frac{3}{5x^2} \cdot \frac{\tan x^3}{\sec x^3}$
\n(B) $\frac{5x^2}{3} \cdot \frac{\sec x^3}{\sec x^3}$
\n(C) $\frac{3x^2}{5} \cdot \frac{\tan x^3}{\sec x^3}$
\n(D) $\frac{5x^2}{5} \cdot \frac{\sec x^3}{\sec x^3}$
\n(E) $\frac{1}{3}x^2 \cdot \tan x^3$
\n(E) $\frac{1}{3}x^2 \tan x^3$
\

- (A) $x^3y 3e^x = cy$
- (B)
- (C) $y^3x 3e^y = cx$
- **(D)** $y^3x + 3e^y = c$

80. For the operation $*$ defined by $\frac{2}{\pi}$ the identity element is (A) 0 (B) 1 (D) $y^2x + 3e^x = cx$

(D) $y^2x + 3e^x = cx$

or the operation * defined by $a^*b = \frac{ab}{2}$, the identity exament is

(A) - 0

(B) 1

(C) 2

(D) $\frac{1}{2}$

(W₁ and W at cume dimensic al., bsp.ces with the same dimension and ¹ For the operation * defined by $a^*b = \frac{ab}{2}$. the it with coefficient is

(A) 0

HB 1

(C) 2

(D) $\frac{1}{2}$

If W_1 and W_2 are simple dimension and $W_3 = W_2$ (C)

(B) $W_1 \cap W_2 = w$

(C) $W_1 \cap W_3 = w$

(C) $W_1 \cap W_2 = w$ (B) $x^3y + 3e^x = 3cy$

(C) $y^3x - 3e^y = cx$

(D) $y^3x + 3e^y = cx$

(D) $y^3x + 3e^y = cx$

(S)

(C) $x^3y + 3e^y = cx$

(C) $x^4y + 3e^y = \frac{ay}{2}$

(C) $x^2y + 3e^y = cx$

(D) $\frac{1}{2}$

- $(C) 2$
- (D)
- 81. If W_1 and W_2 are finite dimensional subspaces with the same dimension and then
	- (A)
	- (B)
	- (C)
	- (D)
- 82. The basis of $\mathbb{R}^3(\mathbb{R})$ from the set $\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$ where $\alpha_1 = (1, -3, 2), \alpha_2 = (2, 4, 1),$ $\alpha_{3} = (3,1,3)$ and $\alpha_{4} = (1,1,1)$ is CUSAT COMMON ADMISSION TEST ²⁰¹⁹
	- (A) $\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$
	- (B) $\{\alpha_1, \alpha_3\}$
- (C)
- (D)

83. Let $S(\mathbb{R})$ be the vector space of all polynomial functions in *x* with coefficient as elements of the field \overline{R} of real numbers. Let *D* and *T* be two linear operators on *V*

defined by $D(f(x)) = \frac{d}{dx} f(x)$ and $T(f(x)) = \int f(x)dx$, or every $f(x) \in I$. Then (A) $ID = I$ (B) *DT* = *I* and *TD* \neq *I* $\left(\mathrm{C}\right)$ et $S(\mathbb{R})$ be the vector space of all polynomial functions \therefore with communis of the field \mathbb{R} of real numbers. Let *D* and *T* be volumear op

effined by $\frac{D(\mathbb{R} \setminus \mathbb{R})}{dx} = \frac{d}{dx} f(x)$ and $T(f(x)) = \int f(x)$ be ve Let $S(\mathbf{R})$ be the vector space of all polynomial functions $\lambda_k = \text{with coefficients, } \lambda_k$
elements of the field \mathbb{R}^2 of real numbers. Let D and T be, so these operators in μ
defined by $D(f(\lambda)) = \frac{d}{dx} f(x)$ and $T(f(x)) = \int f(x)$ (D) $\{a_2, a_3, a_4\}$

(D) $\{a_2, a_3, a_4\}$

83. Let ^{S(R)} be the vector space of all pole elements of the field \bigotimes of real numbers.

defined by $\bigotimes_{i=1}^{D} \{a_i\}$ and $T(f(x))$

(A) $\{2D \} = I$

(C) $DT \neq I$

(D) $TD = I$

CUSAT COMMON ADMISSION TEST 2019

(D) $TD = I$ and $DT \neq I$

- 84. A linear transformation $T : \mathbb{R}^2 \to \mathbb{R}^2$ is such that $T(1, 0) = (1, 1)$ and $T(0, 1) = (-1, 2)$. Then *T* maps the square with vertices $(0, 0)$, $(1, 0)$, $(1, 1)$ and $(0, 1)$ into a
	- (A) rectangle
	- (B) trapezium
	- (C) square
	- (D) parallelogram

85. Let *T* be a linear operator on $\sqrt{3}$ (k) defined by $\sqrt{1}$ (a, b, c), $\sqrt{2}$ (b, 2a $\sqrt{2}$), $\sqrt{6}$ all Then CO square

CO square

ct T be a linear operator on $V_s(\mathbb{R})$ defined by $T(a,b,c) = V_s(a)$
 $V_s(b,c) = V_s(\mathbb{R})$. Then $T^{(1)}(p,q,r) =$

(A) $\left(\frac{1}{3}, \frac{1}{3}, -\frac{1}{p+q}, \frac{1}{2p+q+r}\right)$

(B) $\left(\frac{p}{3}, \frac{p}{3}, -q, r-p+q\right)$

(C) $\left(\frac{p}{3} +$ (C) square

(D) parallelogram

(D) parallelogram

(a, b, c) = {(R) Then T' (p,q,r) =

(A) $\frac{1}{3}$, $\frac{1}{2}$, $\frac{1}{(n+q+1)}$

(B) $\left[\frac{p}{3}, \frac{p}{3}$, q,r, p + q)

(C) $\left[\frac{p}{3} + q, \frac{1}{p-q}, \frac{1}{2p+q+r}\right]$

(C) $\left[\frac{p}{3} +$ COMPLETE COMPL

$$
(1) \ \ \binom{1}{3p}, \frac{1}{p-q}, \frac{1}{2p+q+r}
$$

(B)

(C)
$$
\left(\frac{p}{3} + q, \frac{1}{p - q} \right) \cdot \frac{p}{q}
$$

$$
(D) \quad \left(\frac{p}{3}, q + 2p, r + p - q \right)
$$

86. A vector of unit length which is orthogonal to the vector $\alpha = (2, -1, 0)$ of $V_3(\mathbb{R})$ with respect to standard inner product is CUSAT COMMON ADMISSION TEST ²⁰¹⁹

(A)
$$
(2 \cdot 7 - 1)
$$

\n
\n $\left(2 \cdot 7 - 1\right)$
\n $\left(3 \cdot 7 - 1\right)$
\n(C) $\left(\frac{2}{\sqrt{3}}, \frac{-2}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$
\n(D) $\left(\sqrt{2}, -\sqrt{2}, \frac{-1}{2}\right)$

87. Let *V* be the vector space $V_2(\mathbb{C})$ with the standard inner product. Let *T* be the linear operator defined by $T(1,0) = (1, -2)$, $T(0,1) = (i, -1)$. Then its adjoint T^* is

$$
(A) \quad T^*(a,b) = (a+b, a+ib) \circlearrowright
$$

- (B)
- (C) $T^*(a,b) = (a \sqrt{b}, -ia-b)$
- **(D)** $T^*(a,b) = (a 2b, ia b)$

88. The value of \overline{r} satisfying $\overline{dt^2}$ $\overline{dt^2}$, where \overline{a} and \overline{b} are constant vectors, given that (B) $T^*(a,b) = (a-2b, a-b)$

(C) $T^*(a,b) = (c-2b, a-b)$

(D) $T^*(a,b) = (a-2b, a-b)$

(B) $T^*(a,b) = (a-2b, a-b)$

(expanse of \overline{r} satisfying $\frac{d^2\overline{r}}{dt^2} = \overline{a}t + \overline{b}$, where \overline{a} and \overline{b} are constant vectors

(A) \over (B) $T^*(a,b) = (a-2b, a+b)$

(C) $T^*(a,b) = (a-2b, a+b)$

(D) $T^*(a,b) = (a-2b, a+b)$

The value of \overline{r} satisfying $\frac{d\overline{r}}{dt} = \overline{a} + \overline{b}$, where \overline{a} and \overline{b} are constant vectors, given that

when $t = 0$, $\overline{r} = 0$ (B) $T^*(a,b) = (a - 2b, a - ib)$

(C) $T^*(a,b) = (a - 2b, a - b)$

(D) $T^*(a,b) = (a - 2b, ia - b)$

The value of \overline{r} satisfying $\frac{d^2\overline{r}}{dt^2} = \overline{a}t + \overline{b}$

when
$$
t = 0
$$
, $\overline{r} = 0$ and $\frac{dr}{dt} = u$ is

(A)
$$
\bar{r} = \frac{1}{2}at^3 + \frac{1}{6}bt^2 + vt
$$

(B)
$$
\bar{r} = \frac{1}{6}at^3 + \frac{1}{2}b^2 + c
$$

(B)
$$
\vec{r} = \frac{1}{6}at^3 + \frac{1}{2}bt^3 + not
$$

\n(C) $\vec{r} = \frac{1}{2}at^3 + not$
\n(D) $\vec{r} = \frac{1}{2}at^3 + ta^3 = tu$
\n
\nThe value of $div(r^2\vec{r})$ is
\n(A) $(n+3)r$
\n(B) $(n+3)r^{2n}$
\n(C) $(n+3)r^{2n}$
\n(D) $mr^{-(n+3)}$
\n(D) $mr^{-(n+3)}$

89. The value o_1

$$
(n \rightarrow 3)r
$$

(B)
$$
(n+3)r^{-2}
$$

$$
(C) \quad (n+3)r^2
$$

(D) $nr^{-(n+3)}$

- 91. The length of the space curve $\overline{x}(t)$ over the parameter range $a \le t \le b$ can be computed by (A) integrating the norm of its can
by

(A) integrating the square of the norm of

(C) integrating the square of the norm of

(D) integrating the square root of the norm

(D) integrating the square root of the norm

(D) i
	- (A) integrating the norm of its tangent vector
	- (B) integrating the square of the norm of its tangent vector
	- (C) integrating the square of the norm of $\overline{x}(t)$
	- (D) integrating the square root of the norm of $\bar{x}(t)$

92. The sum $\cos \theta + \cos 3\theta + ... + \cos (2n + 1)\theta$ is $\text{-} \text{val}$ to

$$
(A) \quad \frac{\sin(2n+2)\theta}{2\sin\theta}
$$

$$
(B) \quad \frac{\cos(2n+1)t}{\cos \theta}
$$

(B) integrating the square of the norm of its tangent vector
\n(C) integrating the square of the norm of
$$
\bar{x}(t)
$$

\n(D) integrating the square root of the norm of $\bar{x}(t)$
\n
\nThe sum $\cos \theta + \cos 3\theta + ... + \cos(2n+1)\theta$ is small to
\n(A) $\frac{\sin(2n+2)\theta}{2\sin \theta}$
\n(B) $\frac{\cos(2n+1)\theta}{\cos \theta}$
\n(C) $\frac{\cos(2n+2)\theta}{2\cos \theta}$
\n(D) $\frac{\sin(2n+1)\theta}{\sin \theta}$
\nThe real and $\frac{\sin \theta}{\cos \theta}$
\n(A) $e^{\frac{\sin(2n+1)\theta}{\sin \theta}}$
\n
\n(A) $e^{\frac{\sin(2n+1)\theta}{\sin \theta}}$
\n
\n $e^{\frac{\cos(\theta)}{\cos \theta}}$, $\log |t|$ for $n \in \mathbb{Z}$

$$
(A) \quad e^{\tau + 2n\tau}, \quad 1 \text{ for } n \in \mathbb{Z}
$$

(C)
$$
\frac{\cos(2n+2)\theta}{2\cos\theta}
$$

\n(D) $\frac{\sin(2n+1)\theta}{\sin\theta}$
\n93. The real and $\frac{\sin\theta}{\cos\theta}$ parts of $(-i)^t$ are respectively
\n(A) $e^{\frac{2}{3} + 2\pi i}$, 1 for $n \in \mathbb{Z}$
\n(C) $e^{\frac{2}{3} + 2n\pi}$, $\log |i|$ for $n \in \mathbb{Z}$
\n(D) $e^{\frac{2}{3} + 2n\pi}$, 0 for $n \in \mathbb{Z}$
\n194. The singularities of $\sqrt{2} = \frac{1}{\sin \pi}$ are

$$
\text{(C)} \quad e^{x-z^n}, \log |-i| \text{ for } n \in \mathbb{Z}
$$

$$
(D) \quad e^{\frac{\pi}{2} \cdot 2n\pi}, \ 0 \text{ for } n \in
$$

94. The singularities of $\frac{1}{\sqrt{2}}$ are

- (A) simple poles at
- (B) simple poles at $z = n\pi(\pm 1, \pm 2, \pm 1)$ and double pole at $z = 0$
- (C) removable singularity at $\leq 2\pi\pi(\pm 1, \pm 2,...)$ and essential singularity at $z = 0$ (A) simple poles at $z = n\pi(\pm 1, \pm 2, \pm 2)$

(C) removable singularity at $z = 0$ and simple poles at $z = n\pi(\pm 1, \pm 2)$

(D) essential singularity at $z = 0$ and simple poles at $z = 0$ and simple poles at $z = 0$ and simple p

CUSAT COMMON ADMISSION TEST 2019

(D) essential singularity at $z = 0$ and simple poles at $z = n\pi(\pm\sqrt{2})$ COMMON SIGNATIVE AND RESERVED TO A RESER CONSUMISTION TO A REPORT OF THE STREET

- (B) continuous everywhere except zero
- (C) continuous for $x > 0$ alone
- (D) continuous for $x \ge 0$ alone

(D) continuous for $x \ge 0$ alone
 $f(x) =\begin{cases} 2x, & 0 \le x < 1 \\ 3, & x = 1 \\ 4x, & 1 < x \le 2 \end{cases}$

(A) is continuous

(C) has a discontinuity of the first 'ind at $z = 1$

(D) has a discontinuity of the first 'ind at $z = 1$

(D) has (D) continuous for $x = 0$

The function

(A) is continuous

(A) is continuous

(B) has a discontinuity of the first "ind at $x = 1$

(D) has a discontinuity of the first K-d from left at $z = 1$

(D) has a discontinuity of (B) continuous everywhere except zero

(C) continuous for $x \ge 0$ alone

(D) continuous for $x \ge 0$ alone

(D) continuous for $x \ge 0$ alone
 $x \ge 2$

(A) $x = 1$

(A) is continuous

(A) is continuous

(B) has a discontinui

100. The function

- (A) is continuous
- (B) has a discontinuity of the first \int ind at $\zeta = 1$
- (C) has a discontinuity of the first k, \cdot d from left at $\cdot = 1$
- (D) has a discontinuity of the second kind at $x = 1$

101. The integral $\int \frac{1}{x}$

- (A) converges absolutely
- (B) converges monotonically
- (C) converges condition.
- (D) diverges

x
\n
$$
x
$$

\n x
\n x

102. The function $\begin{cases} 0, & x = 0 \end{cases}$ is

- (A) discontinuous at $x = 0$
- (E) not differentiable at $x = 0$
- (C) differentiable everywhere but its derivative is not continuous at $x = 0$
- (D) not differentiable at $x = 0$ and its derivative is also not differentiable at $x = 0$

103. The Fourier series corresponding to $f(x) = \begin{cases} 0, & -\pi \le x < 0 \\ 1, & 0 \le x \le \pi \end{cases}$ is

(a)
$$
\frac{1}{4} + \frac{1}{4} [\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5}]
$$

\n(b) $\frac{1}{4} + \frac{1}{4} [\cos x - \frac{\cos 3x}{3} + \frac{\cos 5x}{3} + ...]$
\n(c) $\frac{1}{2} + \frac{2}{4} [\sin x + \frac{\sin 5x}{2} + \frac{\sin 3x}{3} + ... + \cos x + \frac{\cos 2x}{2} + \frac{\cos 3x}{2}]$
\n(d) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + ...]$
\n(e) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + ...]$
\n(f) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + ...]$
\n(g) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 3x}{3} + \frac{\sin 5x}{5} + ...]$
\n(h) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 5x}{3} + ...]$
\n(i) $\frac{1}{2} + \frac{2}{3} [\sin x + \frac{\sin 5x}{3} + ...]$
\n(j) $\frac{5}{12} + \frac{1}{12} [\cos x + \frac{\cos 2x}{3} + \frac{\cos 3x}{3} + ...]$

104. If three coplanar forces keep a rigid body in equilibrium, then

- (A) they are all concurrent
- (B) they are all parallel
- (C) either they are all parallel or concurrent
- (D) they all act along the sides of a triangle in order

105. The shape of a uniform string hanging under gravity is given by

(A) they are all concurrent
\n(B) they are all parallel
\n(C) either they are all parallel or concurrent
\n(D) they all act along the sides of a triangle in order
\n105. The shape of a uniform string hanging under gravity is given by
\n(A)
$$
y = c \cos \frac{x}{2}
$$

\n(A) $y = c \cos \frac{x}{2}$
\n(B) $x = r \cos^{-1} \left(1 - \frac{y}{r}\right) - \sqrt{y(2r - y)}$
\n(C) $(x + c)^2 = 4ay$
\n(D) $y = c \cosh^2 \left(\frac{x}{L}\right)$
\n106. The period of ϵ simple pendulum it
\n(A) $2\sqrt{\frac{g}{r}}$
\n(B) $4\pi \sqrt{\frac{g}{r}}$
\n(C) $2\pi \sqrt{\frac{g}{g}}$

- (D)
- 106. The period of ϵ simple pendulum is

- 107. The moment of inertia of a right circular hollow cylinder of base radius *a* and mass *M* about the axis of the cylinder is simple pendulum is

Simple pendulum is

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The cylinder is

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	- (A) *Ma*³
	- (B) *Ma*²
	- (C) *Ma*²/3
	- (D) $Ma^3/2$

- 108. The distance of the point $(1, -2, 3)$ from the plane $x y + z = 5$ measured parallel to the line whose direction cosines are proportional to $2, 3, -6$ is line whose direction cosines are proportional

(A) $\sqrt{7}$

(B) $\sqrt{7}/5$

(C) 3

(D) 1

109. The planes

(A) ontersect at a point

(G) intersect along a line

(C) do not intersect at all

(D) form a triangular prism

(D)
	- (B)
	- (C) 3

(A)

(D) 1

109. The planes $x^3 + 2y + z - 3 = 0$, $x + y - 2z - 3 = 0$ and

- (A) intersect at a point
- (B) intersect along a line
- (C) do not intersect at all
- (D) form a triangular prism

110. The plane $x + 2y - z = 4$ and the sphere x^2

- (A) do not meet each ther
- (B) intersect at only one point
- (C) intersect γ_{on} a circle of unit radius
- (D) intersect along the great challe
- 111. The equations of two tangent planes to the sphere $x^2 + y^2 + z^2 2y 6z + 5 = 0$ which are parallel to the plane $2x + 2y - z = 0$ are (B) $\sqrt{7}/5$

C) 3

be planes:

(A) Offersect at a point

(C) do not intersect along a line

(C) do not intersect at all

(D) form a triangular prism

he plane $x + 2y - z = 4$ and the sphere $x^2 + y^2 + z^2 + z^2 + z - 2 = 0$

(A) do (B) $\sqrt{7}/5$

(C) 3

(D) 1

The planes ($\sqrt{2}y + z - 3 = 0$, $x + y - 2z - 3 = 0$ and $\sqrt{5}$)

(A) one not intersect at a point

(B) intersect at a point

(D) do not intersect and a disc spliter

(D) do not intersect and one poi eet each, ther

at only one point

at only one point

along the greet cn de

along the greet cn de

f tw, ' tangent planes to the sphere $x^2 + y^2 + z^2 - 2y - 6z + 5 = 0$ which are

kk, $2x + 2y - z = 0$ are
 $z + (1 \pm 2\sqrt{5}) = 0$
 z
	- (A)
	- (B)

(C)
$$
6x + 6y - 3z + 3\sqrt{5} = 0
$$
, $2x + 2y - z + 3\sqrt{5} = 0$

(D)
$$
6x + 6y - 3z + (1 + 3\sqrt{5}) = 0
$$
, $2x + 2y - z + (1 - 3\sqrt{5}) = 0$

112. The equation of a right circular cone with vertex at origin 0, axis the x-axis and semivertical angle \vee is

$$
(A) \quad x^2 + y^2 = x^2 \sec \overline{h^2} \alpha
$$

- (B)
- (C)
- **(D)** $x^2 + y^2 = x^2 \tanh^2 \alpha$
- 113. The equation of a cylinder which passes through $f_1(x, y, z) = 0$, $\int_{-\infty}^{\infty} (x, y, z) = 0$ and having its generator parallel to the x-axis can be obtained by the equation of a cylinder which passes through $f_1(x, y, z) = 0$, $(x, y, z) = 0$

s generator parallel to the x-axis can be obtained by

(A) adding f_1 and f_2

(E) adding f_1 with λf_1 where λ is a valar

(C) elim (C) $y^2 + z^2 = x^2 \tan^2 \alpha$

(D) $x^2 + y^2 = x^2 \tanh^2 \alpha$

113. The equation of a cylinder which passes throwing is generator parallel to the x-axis can be obt

(A) adding f_1 and f_2

(C) eliminating x

(D) multiplying f_1
	- (A) adding f_1 and f_2
	- (B) adding f_1 with λf_1 where λ is a scalar
	- (C) eliminating *x*
	- (D) multiplying f_1 and f_2
	- 114. If the equation $M(x, y)$ ∞ $N(x, y)$ $dy = 0$ is exact, then

The equation of a cylinder which passes through
$$
f_1(x, y, z) = 0
$$
. $(x, y, z) = 0$ and having
its generator parallel to the x-axis can be obtained by
(A) adding f_1 and f_2
(B) adding f_1 with λf_1 where λ is z -value.
(C) eliminating x
(D) multiplying f_1 and f_2
(E) multiplying f_1 and f_2
(D) multiplying f_1 and f_2
(E) The equation $M(x, y)$ as $N(x, y)$ is exact, then
(A) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$
(B) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$
(C) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y}$

115. The solution of $D^2(D^2 + 4)y = 96x^2$

If the equation
$$
M(x, y)dx = N(x, y)dy = 0
$$
 is exact, then
\n(A) $\frac{\partial M}{\partial x} = -\frac{\partial N}{\partial x}$
\n(B) $\frac{\partial M}{\partial x} = -\frac{\partial N}{\partial x}$
\n(C) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial x}$
\n
\n(a) $y = \frac{1}{4} \left(x^2 - \frac{1}{2} \right) + A \cos 2x + B \sin 2x$
\n(B) $y = 2x^4 - 6x^2 + 2A \cos 2x + B \sin 2x + E + Fx^2$

(B) $y = 2x^4 - 6x^2 + 6x^2 \cos 2x + B \sin 2x + E + Fx^2$

116. The differential equation obtained by eliminating *a*, *b* and *c* from

z = a(x + y) + b(x - y) + abt + c is
\n(A)
$$
\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = 4\frac{\partial^2 z}{\partial t^2} \le 4\sqrt{2}
$$

\n(B) $\frac{\partial^2 z}{\partial x^2} + \left(\frac{\partial z}{\partial t}\right)^2 \le \frac{\partial^2 z}{\partial y^2}$
\n(C) $\left(\frac{\partial z}{\partial x}\right)^2 + \frac{\partial z}{\partial y} = 4\frac{\partial^2 z}{\partial t^2}$
\n(D) $\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = 4\frac{\partial z}{\partial t}$
\n(A) $y^2 = 2x$
\n(B) $y = x^2 + 3x^2$
\n(C) $3y = x^2$
\n(D) $y = x$
\n318. The Legendre equation is given by
\n(A) $x = x^3 + xy^3 + (x^2 - n^2)y = 0$
\n(B) $(1-x^2)y^3 + 2xy^3 + (n+1)y = 0$

117. An envelope of $\frac{4}{15}$ is

(A) (B) (C) (D) $\bar{y} = x$

118. The Legendre equation is given by

(A) (B) (C) (D) CUSAT COMMON ADMISSION TEST ²⁰¹⁹

- 119. The harmonic function $\phi(x, y)$ cannot attain either its maximum or minimum inside a region Ω of \mathbb{R}^2
	- (A) unless \hat{m} is trivial
	- (B) unless $\hat{\mathcal{M}}$ is a constant function
	- (C) if \hat{m} is unbounded
	- (D) if \hat{f} and its first partial derivatives are unbounded
- 120. Let $S = \mathbb{R} \setminus \{0,1\}$ and let f_1, f_2, f_3 be functions on S a. $\int_0^\infty \log f_1(x) dx = \frac{f_1(x)}{1-x}$ B) unless \hat{m} is a constant function

C) if \hat{m} is unbounded

D) if \hat{m} and its first partial derivatives are unbounded

et $S = \mathbb{R} \times [0,1]$ and let f_1, f_2, f_3 be functions on $\hat{\omega}$ a. "wed by $f_1(x) = x$, (B) unless *fl* is a constant function

(D) if *fl* is an isomoded

(D) if *fl* is an isomoded

(D) if *fl* is this this first partial derivatives are unbounded

Let $S = \mathbb{R} \leq |0,1|$ and let $\int_1^1 \sqrt{2\pi} f$ be function CHECK THE LATTER THE LATTER CHECK COMMON COMMON COMMON CONTRESS (A) and its first partial derivatives and contract COMMON TEST 2019 and let f_1, f_2, f_3 be function (C) Let $S = \mathbb{R} - \{0, 1\}$ and let f_1, f_2, f_3 be fu
	- x Then these functions under the operation composition of functions form a
	- (A) group
	- (B) semigroup
	- (C) abelian group
	- (D) monoid
	- 121. The total number of subgroups of \mathbb{Z} co. tan ed in 20 \mathbb{Z} is
		- (A) 6
		- (B) 2
		- (C) intrite
		- (D) zero
	- 122. Let *G* be the group fal. 2×2 diagonal matrices under multiplication. Then the centre of *G* is

The total number of subgroups of Z co. tained in 20 Z is
\n(A) 6
\n(B) 2
\n(C) int. ite
\n(F) zero
\nlet G be the group
$$
\pm
$$
 al. 2 × 2 diagonal matrices under multiplication. Then the centre of
\n \vec{J} is
\n(A) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$
\n(B) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
\n(C) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

- 124. Let *R* be the ring of all real valued functions defined on \mathbb{R} under pointwise addition and multiplication. Which of the following subset of *R* is not a subring?
	- (A) Set of all continuous functions
	- (B) Set of all plynomial functions
	- (C) Set of all functions which are zero at finitely many points together with the zero function
	- (D) Set \mathbf{c}^* all functions which are zero at infinite number of points
- 125. If *A* and *B* are sets such that $O(A) = 5$ and $O(B) = 3$, then the number of binary relations from A to B is
	- (A) 2^{25}
	- (B) $2⁹$
	- (C) 2^{15}
	- (D) 2^{24}
- 126. Let $R = (a, a), (b, c), (a, b)$ be a relation on the set $\{a, b, c\}$. The minimum set of elements that should be added to *R* so that it becomes antisymmetric is
	- (A)
	- (B)
	- (C)
	- (D)

127. Let the line $\frac{3}{5}$ $\frac{3}{5}$ $\frac{3}{5}$ $\frac{1}{2}$ lie on the plane Then the point $\frac{1}{2}$ $\frac{1}{2}$ lie on the point (α, β) lie in (B) $|(b, b), (c, c), (c, b) \in (8, a), (a, c), (c, a)$

(C) $|(a, c)|$

(D) $|\hat{m}|$

(D) $|\hat{m}|$

(C) $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$

lie op un place $x + 3y - a(-\beta) = 0$. Then the (a, β) lie in

(A) $x + y = 1$

(C) $x + y = 13$

(D) $x - y = 2$

(D) 126. Let $x = (a, b), (b, a)$ be a relation on
elements that should be added to R so that it

(A) $(c, b), (b, a)$

(B) $(b, b), (c, c), (c, b), (b, a), (a, c), (c, a)$

(C) (a, c)

(D) \hat{m}

(D) \hat{m}

(C) \hat{m}

(C) \hat{m}

(C) \hat{m}

(C

- (A)
- (B)
- (C)
- (D)

128. The points on the line $\frac{3}{2}$ $\frac{2}{4}$ at a distance 5 units from the point (1, 3, 3) are (B) $\begin{pmatrix} (b, b), (c, c), (c, b), (3, d), (a, c), (c, a) \end{pmatrix}$

(C) $\begin{pmatrix} a, c \\ (0, b) \end{pmatrix}$

(D) \hat{B}

(D) \hat{C}
 $\begin{pmatrix} x^{-2} & y^{-1} \\ (a, b) & z^2 \end{pmatrix} = \frac{y^{-1}}{5} = \frac{z+2}{2}$ lie op die odaze $x+3y-a\sqrt{z}+ \beta = 0$. Then the point

(A) $x+y=$

(A) $(7, 8,)$ and $(-3, -4, 2)$ (B) $(3, 7, 7)$ and $(-2, -3, -3)$ (C) $(3, 2, 2)$ and $(-2, -1, 3)$ (1) $(2, -1, 3)$ and $(4, 3, 7)$

129. Ram and Gopi appear for an interview for two vacancies in a company. The probability of Ram's selection is 5 and that of Gop is 6 . The probability that none of them is selected is A

1. The $\frac{(1+2)}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ at a distance 5 units from the point (1, 3, 3)

and (-2, -3, -3)

and (-2, -1, 3)

and (4, 3, 7)

appear for an interview for two vacancies in a company. The probability

tion is

$$
(A) \quad \frac{2}{3}
$$

133. When a force $f = (x - y + x)t - (2xy + y)t$ displaces a particle in the *xy* plane from $(0, 0)$ to $(1, 1)$ along the curve $y = x$, the work done is

- 134. The unit normal to the surface $x^3 xyz + z^3 = 1$ at the point (1, 1, 1) is
- (A) $2\hat{i} \hat{j} + \hat{k}$ (B) $\frac{1}{3}(2\hat{i} - \hat{j} + 2\hat{k})$ (C) $\frac{2}{3}(2\hat{i} - \hat{j} + 2\hat{k})$ (D) (B) $\frac{1}{3}(2i - j + 2k)$

CO $\frac{2}{3}(2i - j + 2k)$

D) $\frac{1}{3}(2i + j + 2k)$

A) $\frac{1}{3}$

A) $\frac{4}{3}$

CD 7

D) 5

A) \tan^{-1}

Explace transform of

A) \tan^{-1 (B) $\frac{1}{3}(2i - j + 2k)$

(C) $\frac{2}{3}(2i - j + 2k)$

(D) $\frac{1}{3}(2i - j + 2k)$

(D) $\frac{1}{3}$

(D) $\frac{1}{3}$
 134. Ine unit normal to the surface

(A) $2\hat{i} - \hat{j} + \hat{k}$

(B) $\frac{1}{3}(2\hat{i} - \hat{j} + 2\hat{k})$

(C) $\frac{2}{3}(2\hat{i} - \hat{j} + 2\hat{k})$

(D) $\frac{1}{3}(\hat{i} \hat{j} \hat{k}) + \hat{k}$

135. The directional derivative of $Q = xy + yz +$

(A) 4

(B) 3

(C) 7

135. The directional derivative of $Q = xy + yz + \sqrt{x}$ at the point (1, 2, 3) along the *x*-axis is

- (A) 4
(B) 3 (B) 3
(C) 7 (C) 7
(D) 5
- (D)
- 136. The Laplace transform of
	- (A) (B)

(C)

 (D)

137. The equation of the sphere which has its centre at (6, -1, 2) and touches the plane $2x - y + 2z - 2 = 0$ is Experiment of

Experiment of

The sphere which bass its centre at (6, -1, 2) and touches the plane

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(A)
$$
x^2 + y^2 + z^2 + 12x + 2y - 4z + 16 = 0
$$

16

141. The largest eigenvalue of $\begin{bmatrix} 16 \end{bmatrix}$

- (A) 16
(B) 21
- (B) 21
(C) 48
- (C) (D) 64
- -
- 142. Let $\begin{bmatrix} 0 & 0 & 3 \end{bmatrix}$ be a matrix with real entries. If the sum and product of the 141. The largest eigenvalue of $\begin{bmatrix} 4 & 16 & 1 \ 16 & 1 & 4 \ 16 & 1 & 4 \end{bmatrix}$ is

(A) 16

(B) 21

(C) 48

(D) 64

142. Let $\begin{bmatrix} 4 & 16 & 1 \ 6 & 1 & 4 \ 10 & 14 & 16 \end{bmatrix}$ be a matrix with reg¹ eigenvalues are 10 and 30 respec

eigenvalues are 10 and 30 respectively, then $a^{2} + b^{2}$ equals

- (A) 20
- (B) 40
- (C) 58
- (D) 65
- 143. A group G is generated by the elements *x*, y with the relations $x^3 = y^2 = (xy)^2 = 1$. Then the order of the group G is (A) 16

(B) 21

CD 48

CO 64

CO 6 3

de a matrix with res¹ encies. If the sum and product of

genvalues are 10 and 30 respectivel then $a^2 + b^2$ equals

(A) 20

(B) 40

CO 58

group G is generated by the eigenerations (A) 16

(B) 21

(C) 48

(D) 64

(B) 21

(C) 48

(D) 6 3

be a matrix with meteorities. If the sum and product of the

eigenvalues are 10 and 30 respectivel then $x^2 + b^2$ equals

(A) 20

(A) 20

(B) 65

A group G is sener
	- (A) 4
	- (B) 6
	- (C) 8
	- (D) 12

144. The number of group homomorphisms from $\mathbb{Z}/20\mathbb{Z}$ to $\mathbb{Z}/29\mathbb{Z}$ is

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- (k) ¹
- (B) 20
- (C) 29
- (D) 25
- 145. Let $f: R \to [0, \infty)$ be continuous function such that $(f(x))^2$ is uniformly continuous. Then
	- (A) *f* is bounded
	- (B) *f* may not be uniformly continuous
	- (C) *f* is uniformly continuous
	- (D) *f* is unbounded

146. For each *x* in [0, 1], let $f(x) = x$ if *x* is rational and let $f(x) = x$ if *x* is irrational. Then B) f may not be uniformly spontinuous

C) f is uniformly continuous

D) f is unbounded

or each x in [8, 1], let $f(x) = x$ if x is rational and let

A

(A) $f(x+1) = f(x)$

(B) $f(x) - f(1-x) = 1$

C) $f(x) + f(1-x) = 1$

(D) $f(x) + f(1-x) =$ (B) f may not be uniformly continuous

(D) f is uniformly continuous

(D) f is uniformly continuous

(D) f is uniformly continuous

Then

Then

(A) $\sqrt{(x+1)} = f(x)$

(C) $f(x-1) - f(x) = 1$

(C) $f(x-1) - f(x) = 1$

(D) $f(x)+f($ 145. Let $f: K \to [0, \infty)$ be continuous function in

Then

(A) f is bounded

(B) f may not be uniformly continuous

(C) f is uniformly continuous

(D) f is unbounded

(D) f (x+1) = f (x)

(C) f (x-1)-f (x) =1

(D) f (x)+f (

$$
(A) \widehat{\mathscr{F}(x+1)} = f(x)
$$

(B)
$$
f(x) - f(1-x) =
$$

(C)
$$
f(x-1)-f(x)=1
$$

- (D) $f(x) + f(1-x) =$
- 147. The residue at $z = 3$ of $(2 1)(z 3)$ is CUSAT CUSAT COMMON ADMINISTRATION TEST 2019
	- (A)
	- (B) -8
	- (C) (D) 0
- 148. If *i* and 2*i* are two roots of a biquadratic equation, then the equation is
	- (A) $x^4 + 5x^2 + 4 = 0$
	- (B) $x^4 + x^2 + 4 = 0$
	- (C) $x^4 + 5x^2 4 = 0$
	- (D) $x^4 5x^2 + 4 = 6$

149. The differential equation of the curve $\sqrt{\frac{y}{x}} + \frac{x^4}{2!} + \frac{x^6}{3!} + \frac{x^8}{4!} + ...$ is

