MATHS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 6

Section A

1. The domain of $\cos^{-1}(2x - 1)$ is :

A. $(0, 1)$

B. $[0, 1]$

C. $[-1, 1]$

D. $(-1, 1)$

Answer: B

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2. If $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix} = 8$, then the value of x is :

A. 2

B. 1

C. -1

D. -2

Answer: D

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3. If A and B are square matrices each of order n such that $|A|=5, |B|=3$ and $|3AB|=405$, then the value of n is :

A. 2

B. 3

C. 4

D. Data insufficient

Answer: B

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4. If $f(x) = -\sqrt{25 - x^2}$ then find $\lim_{x \to 1} \frac{f(x) - f(1)}{x - 1}$

A. -24

B. $\sqrt{24}$

C. $\frac{1}{\sqrt{24}}$

D. 5

Answer: C

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5. The feasible region of the system of linear inequations

$x + 2y \leq 120, x + y \geq 60, x - 2y \geq 0, x, y \geq 0$:

A. is bounded and lies in first quadrant .

B. is unbounded and lies in first quadrant.

C. does in first quadrant .

D. does not exist.

Answer: A

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6. If $f(x) = x^3 - 6x^2 + 9x + 3$ is a strictly increasing function ,then x lies in :

A. $(-1, 3)$

B. $(3, \infty)$

C. $(-\infty, 1) \cup (3, \infty)$

D. $(\infty, -1) \cup (3, \infty)$

Answer: C

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7. The total number of possible matrices of order 3×3 with each 3 or 7 is :

A. 21

B. 10

C. 512

D. 343

Answer: C

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8. The signum function $f: R \to R$ defined as

$$f(x) = \begin{cases} 1, & x < 0 \\ 0, & x = 0 \\ -1, & x < 0 \end{cases}$$ is :

A. one -one but not onto

B. onto but not one -one

C. both one -one and onto

D. neither one -one nor onto

Answer: D

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9. $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y-13 \\ y & x+6 \end{bmatrix}$ then the value of x, y is

A. 2,3

B. 3,1

C. $\frac{7}{4}, \frac{3}{2}$

D. $1, 3$

Answer: A

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10. The slope of tangents to the curve $y = 9x^3 + 7$ at x=-1andx=1` are :

A. perpendicular

B. at an angle of $\frac{\pi}{3}$

C. parallel

D. at an angle of $\frac{\pi}{4}$

Answer: C

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11. Let R be a relation on the set of natural numbers ,defined as R ={(x,y):x+2y=20, x,yεN} and x ε {1,2,3,4,5} .Then ,the range of R is :

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12. If $y = \log(\sin x - \cos x)$, then $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is :

A. 0

B. 1

C. $\frac{1}{2}$

D. -2

Answer: B

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13. Which of the following matrices is both symmetric and skew -symmetric ?

A. Identity matrix

B. Diagonal matrix

C. square matrix

D. Null matrix

Answer: D

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14. If $y = e^{x + e^{x + e^{x + \ldots \text{to} \infty}}}$, then: $\frac{dy}{dx} =$

A. $\frac{y}{y - 1}$

B. $\frac{y}{1 - y}$

C. $\frac{y}{y^2 - 1}$

D. $\frac{y}{1 - y^2}$

Answer: B

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15. The equation of normal to the curve $x^2 = 3 - 2y$ at (1,1) is :

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16. The value of k for which the area of triangle with vertices (2,-6) , (5,4) and (k,4) is 35 sq. units ,is :

A. $-2, 12$

B. $-2, \ -12$

C. $2, 12$

D. $-12, 2$

Answer: A

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17. The corner points of the feasible region of a LPP are (20,0),(10,50),(0,60) and (0,0). If Z= 50x +15y, then maximum value of Z occurs at :

A. $(20, 0)$

B. $(10, 50)$

C. (0.60)

D. $(0, 0)$

Answer: B

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18. The least value of the function $f(x) = 10x^2 + \frac{10240}{x}$ occurs at :

A. $x = -2$

B. $x = 4$

C. $x = -6$

D. $x = 8$

Answer: D

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19. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$, then the value of $\left|A^2 - 2A\right|$ is :

A. 24

B. 26

C. 25

D. 27

Answer: C

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20. Determine the constants 'a' and 'b' so that the function 'f' defined below is continuous everywhere :

$$f(x) = \begin{cases} x + 2, & x \leq 2 \\ ax + b, & 2 < x < 5 \\ 3x - 2, & x \geq 5 \end{cases}.$$

A. $-1, 2$

B. $3, 2$

C. $3, -2$

D. $2, -1$

Answer: C

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Section B

1. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$ such that $A^2 = B$, then what is the value of α ?

A. -1

B. 1

C. 2

D. -2

Answer: B

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2. If $f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x} & , \text{for} -1 \leq x < 0 \\ 2x^2 + 3x - 2 & , \text{for} 0 \leq x \leq 1 \end{cases}$

A. -1

B. -2

C. -3

D. -4

Answer: B

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3. The carner points of the feasible region formed by the system of linear inequations $x - y \geq -1, -x + y \geq 0, x + y \leq 2$ and $x, y \geq 0$, are

A. $(0, 0), (-1, 0), (0, 1)$

B. $(0, 0), (2, 0), (1, 1)$

C. $(0, 1), (1, 1), (0, 0)$

D. $(0, 0), (1, 1), \left(\frac{1}{2}, \frac{3}{2}\right), (0, 1)$

Answer: D

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4. If the matrix $\begin{bmatrix} 1 & 2 & x \\ 1 & 1 & 1 \\ 2 & 1 & -1 \end{bmatrix}$ is singular , then the value of x is :

A. 4

B. 3

C. 2

D. 1

Answer: A

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5. Write the principal value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right)$

A. $-\frac{\pi}{12}$

B. $\frac{11\pi}{12}$

C. $\frac{7\pi}{12}$

D. $\frac{\pi}{12}$

Answer: B

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6. The relation R in the set A be defined as $R = \{(a, b)a \leq b\}$, then , R is :

A. reflexive symmetric but not transitive .

B. symmetric ,transitive bit not reflexive.

C. reflexive ,transitive but not symmetric

D. an equivalence relation.

Answer: C

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7. If normal to the curve $x^2 + y^2 - 2x - 3 = 0$ is parallel to the y-axis ,then :

A. y=0

B. x=1

C. y=1

D. x=0

Answer: B

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8. The function f defined by $f(x) = \dfrac{4\sin x - 2x - x\cos x}{2 + \cos x}, 0 \le x \le 2\pi$ is :

A. increasing in $\left(0, \dfrac{\pi}{2}\right)$ and decreasing in $\left(\dfrac{3\pi}{2}, 2\pi\right)$.

B. increasing in $\left(-\dfrac{\pi}{2}, 0\right)$ and decreasing in $\left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right) \cup \left(\dfrac{3\pi}{2}, 2\pi\right)$

C. increasing in $\left(\dfrac{3\pi}{2}, 2\pi\right)$ and decreasing in $\left(0, \dfrac{\pi}{2}\right) \cap \left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right)$.

D. increasing in $\left(0, \dfrac{\pi}{2}\right) \cup \left(\dfrac{3\pi}{2}, 2\pi\right)$ and decreasing in $\left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right)$.

Answer: D

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9. The derivative of $\sin^2 x$ with respect to $e^{\cos x}$ is :

A. $-2\cos x e^{-\cos x}$

B. $2\cos x e^{-\cos x}$

C. $2\cos x e^{\cos x}$

D. $-2\cos x e^{\cos x}$

Answer: A

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10. If $x = \sin t$ and $y = \cos 2t$, then $\frac{dy}{dx}$ =

A. 2 sin 2t

B. 4 sin t

C. $-4\sin t$

D. $2\sin t$

Answer: C

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11. find the least value of a such that the function $x^2 + ax + 1$ is strictly increasing on $(1, 2)$

A. -1

B. -2

C. 2

D. 4

Answer: B

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12. If set A has 3 elements and the set B has 5 elements , then , the number of injective mappings that can be defined from A to B is :

A. 60

B. 120

C. 240

D. 360

Answer: A

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13. If C_{ij} denotes the cofactor of the elements a_{ij} of the determinant $A = \begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ then the value of $a_{12}C_{12} + a_{32}C_{32}$ is :

A. -28

B. -32

C. 41

D. 17

Answer: A

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14. The derivative of $\sqrt{\sec\sqrt{x}}$ with respect to x , is

:

A. $\frac{1}{4\sqrt{x}}\sec\sqrt{x}\tan\sqrt{x}$

B. $\frac{1}{4\sqrt{x}}\sqrt{\sec\sqrt{x}}\sin x$

C. $\frac{1}{4\sqrt{\sqrt{x}}}\left(\sec\sqrt{x}\right)^{3/2}\sin\sqrt{x}$

D. $\frac{1}{4\sqrt{x}}\sec\sqrt{x}\sin\sqrt{x}$

Answer: C

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15. If

$A = \begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}$ and $A^3 - 6A^2 + 5A + 6l = O$,

then the value of A^{-1} is :

A. $\begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 4 \\ -9 & -2 \end{bmatrix}$

C. $\begin{bmatrix} 6 & -7 \\ 4 & -3 \end{bmatrix}$

D. $\begin{bmatrix} -2 & 3 \\ -1 & 4 \end{bmatrix}$

Answer: A

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16. The corner points of the feasible region determined by a system of linear inequations are (0,0),(4,0),(2,4) and (0,5). If the minimum value of Z=ax+by,a, $b > 0$ occurs at (2,4) and (0,5) ,then :

A. $a = 2b$

B. $2a = b$

C. $a = b$

D. $3a = b$

Answer: B

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17. If $\begin{vmatrix} 4 & 1 \\ 2 & 1 \end{vmatrix}^2 = \begin{vmatrix} 3 & 2 \\ 1 & x \end{vmatrix} - \begin{vmatrix} x & 3 \\ -2 & 1 \end{vmatrix}$, then the value of x is :

A. 5

B. 6

C. 8

D. 9

Answer: B

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18. The curve $y = x^{\frac{1}{5}}$ has at (0, 0)

A. a vertical tangent (parallel to y -axis)

B. a horizontal tangent (parallel to x - axis)

C. an oblique tangent

D. no tangent

Answer: A

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19. The Minimum value of the function $f(x) = x^3 - 18x^2 + 96x$ in $[0, 9]$

A. 126

B. 0

C. 135

D. 160

Answer: B

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20. If $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$, then

AB=

A. $\begin{bmatrix} 14 & 20 & 25 \\ 24 & 18 & 16 \end{bmatrix}$

B. $\begin{bmatrix} 14 & 24 \\ 20 & 18 \\ 25 & 16 \end{bmatrix}$

C. $\begin{bmatrix} 14 & 20 \\ 22 & 25 \end{bmatrix}$

D. $4\begin{bmatrix} 25 & 22 \\ 20 & 14 \end{bmatrix}$

Answer: C

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Section C

1. Let R be the relation in the set N given by R = $\{a, b) : a$ is a multiple of b} .Then :

A. $(2, 3) \in R$

B. $(4, 6) \in R$

C. $(3, 9) \in R$

D. $(7, 24) \in R$

Answer: C

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2. If A is a non - singular ,square matrix of order 3 and |A| =4 ,then the valie of |adj A| is :

A. 27

B. 16

C. 64

D. 81

Answer: B

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3. At x = $\frac{5\pi}{6}$, f(x)= 2sin 3x+3 cos 3x is

A. maximum

B. minimum

C. zero

D. neither maximum nor minimum .

Answer: D

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4. The function $f(x) = \frac{16 + x^2}{9 - x^2}$ is :

A. discontinuous at only one point.

B. discontinuous at exactly two points.

C. discontinuous at exactly three points.

D. a continuos function.

Answer: C

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5. Find the principal value of $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)$

A. $\frac{3\pi}{4}$

B. $\frac{5\pi}{4}$

C. $-\frac{\pi}{4}$

D. $\frac{\pi}{4}$

Answer: D

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6. Find the principal value of: $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

A. $\frac{\pi}{6}$

B. $\frac{\pi}{6}$

C. $\frac{5\pi}{6}$

D. $\frac{11\pi}{6}$

Answer: B

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7. The principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$ is

A. $\frac{2\pi}{3}$

B. $\frac{4\pi}{3}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: A

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8. The principal value of $\text{cosec}^{-1}\left(-\sqrt{2}\right)$ is

A. $\frac{\pi}{4}$

B. $\frac{5\pi}{4}$

C. $-\frac{\pi}{4}$

D. $\frac{3\pi}{4}$

Answer: C

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9. Write the principal value of $\sec^{-1}(-2)$

A. $\frac{2\pi}{3}$

B. $-\frac{\pi}{3}$

C. $\frac{\pi}{3}$

D. $-\frac{2\pi}{3}$

Answer: A

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