MATHS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 4

Section A

1. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$. Hence, find A^{-1}.

A. $\frac{1}{7}\begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$

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

C. $\frac{1}{7}\begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$

D. Does not exist

Answer: C

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2. $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$

A. $\frac{\pi}{4}+\frac{x}{2}$

B. $\frac{\pi}{2}-\frac{\pi}{2}$

C. $\frac{\pi}{4}-\frac{x}{2}$

D. $\frac{\pi}{2}+\frac{x}{2}$

Answer: A

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3. Let the relation R in the set of natural numbers be defined as $b \leq a^2$. Then, the equivalence class containing 2 is :

A. $\{0, 1\}$

B. $\{1\}$

C. N

D. All natural numbers except 1

Answer: B

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4. Let $A = [a_{ij}]$ be a square matrix of order 2 and |A| =2. Then, the value of $|5A|$

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5. If $x = a\sec\theta, y = b\tan\theta$ then $\frac{dy}{dx} = ?$

A. $\frac{2b}{a}$

B. $\frac{a}{b}$

C. $\frac{b}{a}$

D. 1

Answer: A

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6. The slope of normal to the curve $y = x + \frac{1}{x}, x > 0\, at\, x = 2$ is :

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

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

C. $\frac{5}{2}$

D. $-\frac{9}{7}$

Answer: B

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7. A rectangle of dimensions x and y units, inscribed in a given circle of fixed radius, will have maximum area, if :

A. $x = 2y$

B. $2x = y$

C. $x + y = 2$

D. $x = y$

Answer: D

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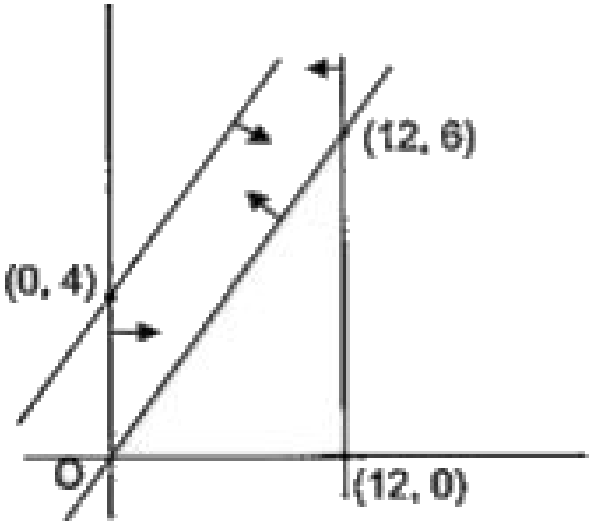
8. The feasible region for an LPP is shown in the below. Let F = 3x - 4y be the objective function. Maximum value of F is :



A. 0

B. 8

C. 12

D. -18

Answer: C

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9. In a LPP, the linear inequalities or restrictions on the variables called.

A. Objective function

B. Non-negative restrications

C. Linear constraints

D. Non-negative constraints

Answer: C

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10. if A relation R in a set A is called ..... if $(a_1, a_2) \in R$ implies $(a_2, a_1) \in R$ for all $a_1, a_2 \in A$.

A. reflective

B. symmetric

C. transitive

D. equivalence

Answer: B

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11. A 2×1 matrix whose elements are given by $a_{ij} = |i - j|^2$ is :

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

B. $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$

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

D. $\begin{bmatrix} 1 \\ 0 \end{bmatrix}$

Answer: B

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12. The vaue of λ so that the function f defined as $f = \begin{cases} \lambda x, & x \leq \pi \\ \cos x, & x > \pi \end{cases}$ is cotinuous at $x = \pi$ is :

A. -1

B. $-\pi$

C. $-\frac{1}{\pi}$

D. 0

Answer: C

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13. If $y = \log(\cos e^x)$, then $\frac{dy}{dx} =$

A. $e^x \cot e^x$

B. $-e^x \sin e^x \log(\cos e^x)$

C. $-e^x \tan e^x$

D. $\frac{1}{\cos e^x}$

Answer: C

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14. If $A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$, then $|2A| =$

A. 2

B. 4

C. 6

D. 8

Answer: D

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15. The interval in which the function f (x) = 7 $-4x - x^2$ is strictly increasing is :

A. $(-\infty, -2)$

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

C. $(-2, \infty)$

D. $(-2, \infty)$

Answer: A

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16. The principle value of $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is :

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

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

C. $\frac{5\pi}{3}$

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

Answer: D

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17. If A is a skew-symmetric matrix of order 3, then |A|=

A. 0

B. 1

C. 3

D. Data insufficient

Answer: A

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18. The derivative of sin x with respect to e^x is :

A. $-e^x \cos x$

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

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

D. $e^x \cos x$

Answer: C

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19. If $\begin{bmatrix}1 & 2 & 3\end{bmatrix}\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix}\begin{bmatrix}1\\2\\3\end{bmatrix} = A$, then the order of matrix A is :

A. 1×3

B. 3×1

C. 3×3

D. 1×1

Answer: D

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20. The critical points of the function $f(x) = 2\sin x, x \in [0, 2\pi]$ are :

A. $0, \frac{\pi}{2}, \frac{3\pi}{2}$

B. $0, \pi, 2\pi$

C. $\frac{\pi}{2}, \frac{3\pi}{2}$

D. $\pi, 2\pi$

Answer: C

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Section B

1. The graph of the inequality $4x + 6y \leq 24$ is :

A. half plane that contains the origin, including the points on the line $4x + 6y = 24$.

B. half plane that does not contain the origin.

C. entire XOY plane.

D. half plane that contains the origin.

Answer: A

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2. Let $A = \{1, 2, 3\}, B\{5, 7, 6\}$ and $f: A \to B$ be defined as $f = \{(1, 7), (2, 6), (3, 5)\}$. Then f is :

A. one-one

B. onto

C. many-one

D. bijective

Answer: A

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3. If $A = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$, then $\left(A^T\right)^{-1} =$

A. $\begin{bmatrix} 2 & -1 \\ -5 & 3 \end{bmatrix}$

B. $\begin{bmatrix} 2 & -5 \\ -1 & 3 \end{bmatrix}$

C. $\begin{bmatrix} -3 & 5 \\ 1 & -2 \end{bmatrix}$

D. $\begin{bmatrix} -3 & 1 \\ 5 & -2 \end{bmatrix}$

Answer: B

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4. Richa went to an amusment park and was trilled to ride into a rollier coaster. While moving towards the roller coaster for a ride, she noticed the track which remainds her the graphs of curves of inverse trignometric functions.

If $y = \sin^{-1} x$, then $\left(1 - x^2\right) \frac{d^2y}{dx^2} - x \frac{dy}{dx} =$

A. 1

B. $\sin^{-1} x$

C. 0

D. 2

Answer: C

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5. The equation of tangent to the curve $y = x^2 + 6x - 4atx = 2$ is :

A. $10x - y = 8 = 0$

B. $x - 10y + 12 = 0$

C. $2x - 10y + 27 = 0$

D. $2x + y - 12 = 0$

Answer: A

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6. The function $f(x) = 2x^3 + 9x^2 + 12x + 20$ is :

A. increasing in $(-\infty, -2)$ and decreasing in $(-2, -1)$.

B. increasing in $(-\infty, -2) \cup (-1, \infty)$ and decreasing in $(-2, -1)$.

C. increasing in $(-2, -1)$ and decreasing in $(-\infty, -2) \cup (-1, \infty)$.

D. increasing in $(-\infty, -2) \cap (-1, \infty)$ and decreasing in $(-2, -1)$.

Answer: B

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7. The value of $\cot\left(\frac{\pi}{2} - 2\cot^{-1}\sqrt{3}\right)$ is :

A. 0

B. $\frac{1}{\sqrt{3}}$

C. $\sqrt{3}$

D. 1

Answer: C

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8. If $[2357]\,[1-3-24] = [-46-9x]$, write the value of x

A. 13

B. 18

C. 28

D. 7

Answer: A

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9. Let R be the relation in the set N given by R = $\{(a, b) : |a - b|$ is odd$\}$. Then:

A. $(0, 1) \in R$

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

C. $(-1, 4) \in R$

D. $(3, 7) \in R$

Answer: B

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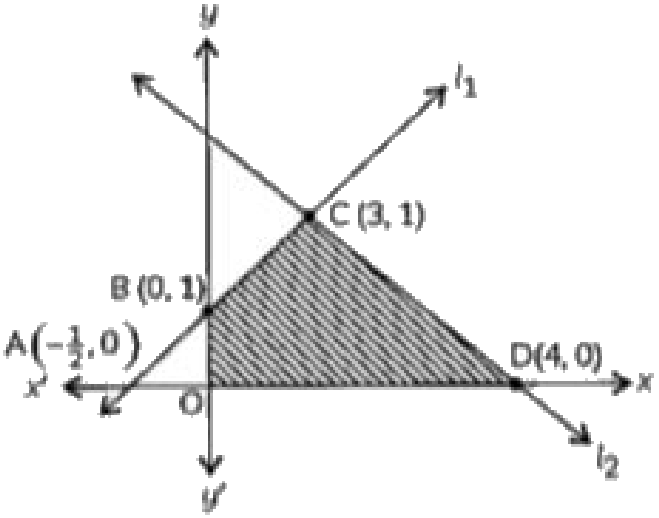
10. The corner points of the feasible region, shown as shaded in the graph below, are :



A. $(0, 1), (3, 1), (4, 0)$

B. $(-\frac{1}{2}, 0)$, (0,1) (3,1) , (4,0)

C. $(0, 0), (0, 1), (3, 1), (4, 0)$

D. $(0, 0), \left(-\frac{1}{2}, -0\right), (0, 1), (3, 1), (4, 0)$

Answer: C

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11. If $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}; C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$ and $2A - 3B + 5C = 0$, then the matrix A is :

A. $\begin{bmatrix} -8 & 3 & 5 \\ -13 & -1 & -9 \end{bmatrix}$

B. $\begin{bmatrix} 16 & -6 & -10 \\ 26 & 2 & 18 \end{bmatrix}$

C. $\begin{bmatrix} 8 & -3 & -5 \\ 13 & 1 & 9 \end{bmatrix}$

D. $\begin{bmatrix} 7 & 4 & -1 \\ 2 & -3 & 5 \end{bmatrix}$

Answer: A

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12. The derivative of $\sin^2\sqrt{x}$ with respect to x is :

A. $\frac{\sin\sqrt{x}}{\sqrt{x}}$

B. $\frac{\sin\left(2\sqrt{x}\right)}{\sqrt{x}}$

C. $\frac{\sin\left(2\sqrt{x}\right)}{2\sqrt{x}}$

D. $\frac{\sin\sqrt{x}}{2\sqrt{x}}$

Answer: B

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13. If $x^m.\ y^n = (x+y)^{m+n}$ then $\frac{dy}{dx}$ is:

A. mn

B. m + n

C. xy

D. $\frac{y}{x}$

Answer: A

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14. The equation of the tangent at (2,3) on the curve $y^2 = ax^3 + b$ is $y = 4x - 5$. Find the values of $aandb$.

A. 1

B. 2

C. 3

D. 4

Answer: B

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15. Evaluate $\begin{vmatrix} 1 & 2 & 3 \\ 3 & -1 & 1 \\ 2 & 3 & 5 \end{vmatrix}$

A. -1

B. 7

C. 51

D. -4

Answer: A

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16. The domain of $\tan^{-1} x$ is :

A. $[-1, 1]$

B. $(-1, 1)$

C. $(-1, 1)[\{0\}$

D. R s

Answer: D

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17. The slope of tangent to the curve $x = a\sin^3 t, y = b\cos^3 t \; at = \frac{\pi}{2}$ is :

A. $-\frac{b}{a}$

B. $\frac{b}{a}$

C. 0

D. 1

Answer: C

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18. If $y + \sin y = \cos x,$ then $\frac{dy}{dx}$ at $\left(\frac{\pi}{2}, \frac{\pi}{2}\right)$ is :

A. -1

B. 0

C. 1

D. 2

Answer: A

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19. If a matrix has 8 elements, then which of the following will not be a possible order of the matrix?

A. 4×2

B. 2×4

C. 4×4

D. 8×1

Answer: C

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20. The function f (t) = tan t -t :

A. always increases

B. always decreases

C. never increases

D. sometimes increases and sometimes decreases

Answer: A

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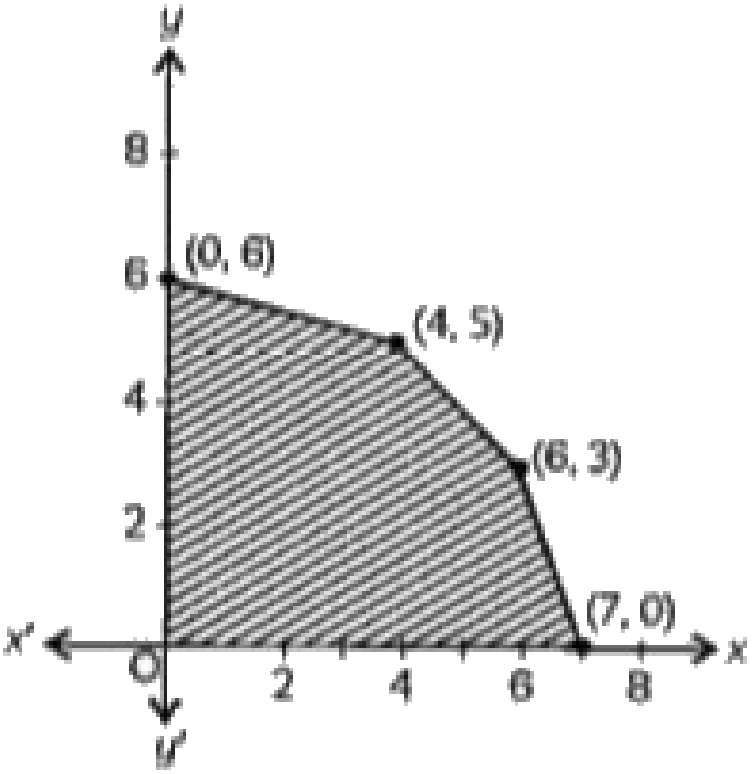
Section C

1. The feasible region for an LPP is shown in the Let Z = 4x + 3y be the objective function. Maximum of Z occur at :



A. $(7, 0)$

B. $(6, 3)$

C. $(0, 6)$

D. $(4, 5)$

Answer: B

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2. On Sunday evening. Riya went to a nearby fair, which was set up every weekend. While leaving, she opened Google maps to check the exact location of a newly opened South Indian Restaurant.

After checking the location of the restaurant, she checked the path traced by her in the fair. The path was a curve which can be represented as y=x^3.

The points on the given curve at which the slope of the tangent is equal to y-coordinate of the point, are:

A. $(0, 0), (2, 8)$

B. $(2, 8), (3, 27)$

C. $(0, 0), (3, 27)$

D. $(8, 2), (27, 3)$

Answer: C

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3. Differentiate $\tan^{-1}\left(\frac{\sqrt{1-x^2}}{x}\right)$ with respect to $\cos^{-1}\left(2x\sqrt{1-x^2}\right)$, when $x \neq 0$.

A. 0

B. $-\frac{1}{2}$

C. -1

D. 2

Answer: B

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4. For a square matrix of order 2, if A (adj A)= $\begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$, then |2A|=

A. 65

B. 16

C. 8

D. 32

Answer:

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5. For the function if $y = x^{x^{x^{x^{- - - - \infty}}}}$, then $\frac{dy}{dx}$ is equal to :

A. $\frac{y^2}{x(1 - y \log x)}$

B. $\frac{y}{x(1+y\log x)}$

C. yx^{y-1}

D. $\frac{y}{x(1+x\log y)}$

Answer: A

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6. Case Study: The purpose of discipline in the workplace is to input of quality in a timely manner. So, two offices A and B want to award their employees on the values of Honesty, Hard work and Punctuality. Rewarding is a way of motivating one person to perform 'better. The office A wants to award Rs x each, y each and Rs z each for the three respective values to its 3, 2 and 1 employees respectively with a total award money of Rs 2200. Office B wants to spend * Rs 3100 to award its 4, 1

and 3 employees on the respective values (by giving the same award money to the three values as office A). The total amount of award for one prize on each value is Rs 1200. It also serve as a healthy competition between employees for becoming a best asset of the company.

Using the concept of matrices and determinants, answer the

following questions.

The minor of element 6 in the determinant $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ is :

A. -6

B. 6

C. 22

D. -22

Answer: A

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7. Case Study: The purpose of discipline in the workplace is to input of quality in a timely manner. So, two offices A and B want to award their employees on the values of Honesty, Hard

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Using the concept of matrices and determinants, answer the following questions.

The cofactor matrix of the determinant $\begin{vmatrix} -1 & 4 \\ 9 & 2 \end{vmatrix}$ is :

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

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

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

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

Answer: D

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