MATHS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER - 5

Section A

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

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

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

C. $\frac{3\pi}{10}$

D. $\frac{5\pi}{12}$

Answer: D

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2. A=$[2 \quad -3 \quad 4], B = \begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix}, X = [1 \quad 2 \quad 3]$ and $Y = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$, then AB + XY =

A. [28]

B. $\begin{bmatrix} 35 \\ 36 \\ 37 \end{bmatrix}$

C. $\begin{bmatrix} 35 & 36 & 37 \end{bmatrix}$

D. $\begin{bmatrix} 28 & 0 & 0 \\ 0 & 28 & 0 \\ 0 & 0 & 28 \end{bmatrix}$

Answer: A

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3. Determine whether Relation R on the set Z of all integer defined as $R = \{(x,\ y) : y \text{ is divisible by } x\}$

A. reflexive

B. symmetric

C. transitive

D. equivalence

Answer: D

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4. If $\begin{bmatrix} 5 & -4 \\ -5 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ 80 \end{bmatrix}$, then the values of x and y, respectively, are :

A. 32, 35

B. 30, 35

C. 35, 32

D. 32, 30

Answer: D

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5. The point which does not lie in the feasible region of $2x + 3y < 18$ is :

A. (9, 0)

B. (0, 0)

C. (4, 1)

D. (1, 5)

Answer: A

6. The equation of normal to the curve $y^2 = 8x$ at (1,2) is :

7. The interval in which the function f given by $f(x) = 7 - 4x + x^2$ is strictly decreasing, is :

A. $(2, \infty)$

B. $[2, \infty)$

C. $(-\infty, 2)$

D. $(-\infty, 2]$

Answer: C

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8. Find the realtionship between a and b so that the function defined by

$$f(x) = \begin{cases} ax + 1 & x \leq 3 \\ bx + 3 & x > 3 \end{cases}$$ is continuous at x=3

A. $a - b = 3$

B. $a + b = 2$

C. $a - b = \frac{2}{3}$

D. $a + b = \frac{3}{2}$

Answer: C

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9. if $y = \left\{x + \sqrt{\left(x^2 + a^2\right)}\right\}^n$ then $\frac{dy}{dx}$ =

A. y

B. xy

C. $\sqrt{x^2 + a^2 y}$

D. $\frac{xy}{\sqrt{x^2 + a^2}}$

Answer: D

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10. The value of x so that the matrix $\begin{bmatrix} 2(x+1) & 2x \\ x & x-2 \end{bmatrix}$ is singular, is :

A. -2

B. -1

C. 1

D. 2

Answer: A

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

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

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

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

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

Answer: B

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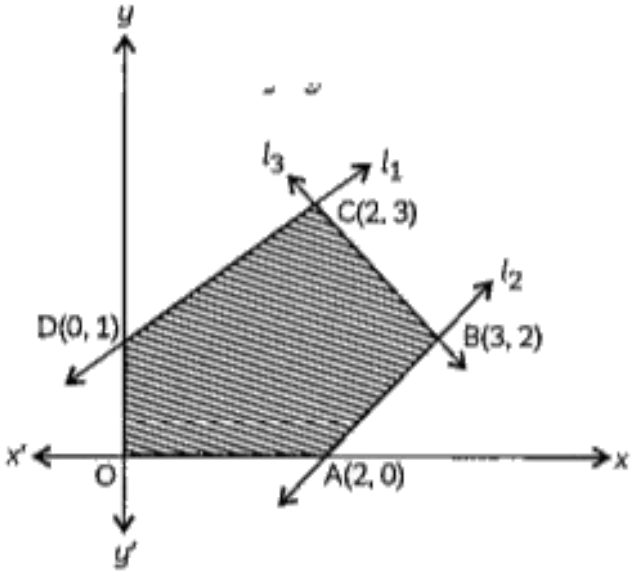
12. The feasible region by a system of linear inequalities is shown shaded in the given graph.



If Z = 4x - 6y, then $Z_{\min}$ =

A. -10

B. 0

C. -18

D. -6

Answer: A

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13. The critical points of the function $y = \frac{3}{2}x^4 - 4x^3 - 45x^2 + 51$ are :

A. $-5, \ -3, 0$

B. 0, 3, 5

C. $-5, 0, 3$

D. $-3, 0, 5$

Answer: D

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14. If A is a square matrix such that $A^2 = A$, then write the value of $7A - (I + A)^3$, where I is the identity matrix.

A. $-I$

B. A

C. $I - A$

D. A + I

Answer: A

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15. The slope of tangent to the curve $y = 2\sin^2(3x)$ at $x = \frac{\pi}{4}$ is :

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. -6

D. -1

Answer: C

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16. If $y = x^{\log x}$, then $\frac{dy}{dx}$ equals

A. $x^{\log x}(1 + \log x)$

B. $2 \log x . x^{\log x - 1}$

C. $\frac{2 \log x}{x}$

D. $2x^{\log x} . \log x$

Answer: B

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17. If A is a square matrix of order 2 and |A| = 7, then the value of $\left|3A^T\right|$ is :

A. 21

B. $\frac{7}{3}$

C. $\frac{3}{7}$

D. 63

Answer: D

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18. The cofactor of element -7 in the matrix $\begin{bmatrix} 5 & 6 & -3 \\ -4 & 3 & 2 \\ -4 & -7 & 3 \end{bmatrix}$ is

A. -2

B. 2

C. -7

D. 7

Answer: B

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19. If $x = \sin\theta - \cos\theta$ and $y = \sin\theta + \cos\theta$, then $\frac{dy}{dx}$ =

A. $x - y$

B. xy

C. $-\frac{x}{y}$

D. $-(x + y)$

Answer: C

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20. Evaluate $\begin{vmatrix} 1 & 2 & 3 \\ 7 & 8 & 9 \\ 3 & 2 & -1 \end{vmatrix}$

A. 12

B. 18

C. 21

D. 24

Answer: A

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Section B

1. Let $f: N \to R$ be a function defined by $f(x) = 4x^2 + 5$. Then f (2), f(3), f(5), f(6) is :

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2. $x + y < 5$

A. half plane containing the origin as well as the point on the line x = y = 5:

B. open half plane not containing the origin

C. open half plane containing the origin

D. entire XOY plane

Answer: C

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3. The value of $\tan^{-1}\left[2\sin\left(2\cos^{-1}\frac{\sqrt{3}}{2}\right)\right]$ is

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

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

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

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

Answer: C

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4. If $f(x) = 2x$ and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be a discontinuous functions?

A. g(x) + f(x)

B. g(x) - f(x)

C. g(x).f(x)

D. $\frac{f(x)}{g(x)}$

Answer: D

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5. The points at which the tangents to the curve $y = x^3 - 12x + 18$ are parallel to the X-axis are

A. (2, -2), (-2, -34)

B. (2, 2), (-2, 34)

C. (2, 34), (-2, 0)

D. (0, 34), (-2, 0)

Answer: B

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6. If the function $f(x) = 2x^2 - kx + 5$ is strictly increasing in [1,2], then 'k' lies in the interval

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

B. $(-\infty, 4)$

C. $(4, \infty)$

D. $(0, \infty)$

Answer: B

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7. The area of triangle with vertices (1, 2), (2, 7) and (4, 9) is :

A. 4 sq. units

B. 8 sq. units

C. 16 sq. units

D. 32 sq. units

Answer: A

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8. If $\begin{bmatrix} 0 & a & b \\ -2 & 0 & -9 \\ -3 & 9 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then the values of a, b respectively are :

A. $-2, 3$

B. $2, 3$

C. $2, \ -3$

D. $-2, \ -3$

Answer: B

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9. If A is square matrix of order 3 such that $|adj\ A| = 64$, find $|A|$.

A. 8

B. 16

C. ± 8

D. ± 16

Answer: C

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10. Corner points of the feasible region for an LPP are $(0, 2), (3, 0), (6, 0), (6, 8)$, and $(0, 5)$. Let $F = 4x + 6y$ be the objective function. Determine the minimum value of F occurs at

A. (0, 2) only

B. (3, 0) only

C. The mid point of the line segment joining the point (0, 2) and (3, 0) only.

D. any point on the line segment joining the points (0, 2) and (3, 0).

Answer: D

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11. Find the derivative of the function given by $f(x) = (1+x)\left(1+x^2\right)\left(1+x^4\right)\left(1+x^8\right)$ and hence find $f'(1)$.

A. 16

B. 120

C. 154

D. 200

Answer: B

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12. The value of $\cos\left[\tan^{-1}\left\{\sin\left(\cot^{-1}x\right)\right\}\right]$ is

A. $\dfrac{1}{\sqrt{1+x^2}}$

B. $\sqrt{\dfrac{x^2+1}{x^2+2}}$

C. $\sqrt{\dfrac{x^2+2}{x^2+1}}$

D. $\dfrac{1}{\sqrt{x^2+2}}$

Answer: B

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13. If A is a 3×3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T is equal to

A. AB

B. BA

C. A

D. I

Answer: D

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14. The least value of the function $f(x) = 4 + 4x + \frac{16}{x}$ is :

A. 4

B. 8

C. 20

D. 24

Answer: C

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15. The point at which normal to the curve $y = \sqrt{4x - 3} - 1$ has its slope $-\frac{3}{2}$ is

A. (3, 2)

B. (-3, 2)

C. (3, -2)

D. (-3, -2)

Answer: A

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

A. $-\frac{2}{1+x^2}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $-\frac{1}{1+x^2}$

Answer: C

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17. In a factory three types of toothbrushes are manufactured everyday. On a certain day, the production is 570. The production of toothbrushes of second kind exceeds the production of

toothbrushes of first kind by 100. Also, the total production of toothbrushes of first and second kinf is four times the production of third kind.

If x, y and z denotes the production of toothbrushes of three kinds, respectively then using matrix method, the algebraic representing of the given condition is :

A. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 570 \\ 100 \\ 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 570 \\ 100 \\ 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 570 \\ 100 \\ 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 570 \\ -100 \\ 0 \end{bmatrix}$

Answer: D

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18. The interval in which the function f defined as $f(x) = 1 - 12x + 9x^2 - 2x^3$ is strictly decreasing,

is :

A. $(-\infty, 1) \cup (2, \infty)$

B. (1, 2)

C. $(-\infty, 1)$

D. $(-\infty, 1) \cup (1, 2)$

Answer: A

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19. $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then $\frac{dy}{dx} =$

A. $\frac{1}{1+x^2}$

B. $-\frac{1}{(1+x)^2}$

C. $\sqrt{\frac{x}{y}}$

D. $\frac{x^2+y}{y^2-x}$

Answer: B

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20. If $f(x)=\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$, then the value of f(0) is :

A. $a+b+c$

B. 3abc

C. 0

D. 1

Answer: C

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Section C

1. Find the simplest value of $f(x) = \tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right), x \in R - \{0\}$

A. $\tan^{-1} x$

B. $2\sec^{-1} x$

C. $\frac{1}{2}\tan^{-1} x$

D. $\sec^{-1} x$

Answer: C

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2. A matrix of order 2×2 whose elements a_{ij} are given by $a_{ij} = \frac{1}{2}|(i+j)|^2$, is a:

A. symmetric matrix

B. skew-symmetric matrix

C. rectangular matrix

D. singular matrix

Answer: A

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3. The corner points of a feasible region of a LPP are (0, 0), (0, 1) and (1, 0). If the objective function is Z = 7x + y, then $Z_{\max} - Z_{\min}$ =

A. 0

B. 1

C. 7

D. 6

Answer: C

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

A. 0

B. $2\sin^{-1} x$

C. 2

D. x

Answer: C

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5. The point on the curve $x^2 = 2y$which is nearest to the point (0, 5) is(A) $\left(2\sqrt{2}, 4\right)$ (B) $\left(2\sqrt{2}, 0\right)$ (C) (0, 0) (D) (2, 2)

A. (0, 0)

B. (2, 2)

C. (5, 9)

D. $\left(2\sqrt{2}, 4\right)$

Answer: D

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6. A function is said to be bijective if it is both one-one and onto, Consider the mapping $f: A \to B$ be defined by $f(x) = \dfrac{x-1}{x-2}$ such that f is a bijection. Domain of f is

A. reflexive

B. $R - \{2\}$

C. $R - \{0\}$

D. $R - \{1, 2\}$

Answer: B

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7. A function is said to be bijective if it is both one-one and onto, Consider the mapping $f: A \to B$ be defined by $f(x) = \dfrac{x-1}{x-2}$ such that f is a bijection.

Range of f is :

A. R - {0}

B. R

C. $R - \{1, 2\}$

D. R - {1}

Answer: D

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8. A function is said to be bijective if it is both one-one and onto, Consider the mapping $f: A \to B$ be defined by $f(x) = \frac{x-1}{x-2}$ such that f is a bijection.

Let $g: R - \{2\} \to R - \{1\}$ be defined by $g(x) = 2f(x) - 1$. Then $g(x)$ in terms of x is :

A. $\frac{x}{x-2}$

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

C. $\frac{x+2}{x}$

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

Answer: A

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9. A function is said to be bijective if it is both one-one and onto, Consider the mapping $f: A \to B$ be defined by $f(x) = \frac{x-1}{x-2}$ such that f is a bijection.

The function g defined above, is :

A. Onto

B. One-one

C. Many-one

D. Bijective

Answer: D

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10. A function is said to be bijective if it is both one-one and onto, Consider the mapping $f: A \to B$ be defined by $f(x) = \frac{x-1}{x-2}$ such that f is a bijection.

A function f(x) is said to be one-one iff :

A. $f(x_1) = f(x_2) \to x_1 = x_2$

B. $f(-x_1) = f(-x_2) \Rightarrow -x_1 = x_2$

C. $f(x_1) = f(x_2) \Rightarrow -x_1 = x_2$

D. $f(-x_1) = f(-x_2) \Rightarrow -x_1 = x_2$

Answer: A

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