MATHS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 09

Sections A

1. A relation in a set A is called ..... relation, if each element of A is related to itself.

A. reflexive

B. symmetric

C. transitive

D. equivalence

Answer:

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2. Evaluate the principal value of v = $\tan^{-1}\left[\sin\left(-\frac{\pi}{2}\right)\right]$ is:

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

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

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

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

Answer:

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

A. $\begin{bmatrix} 3 & 9 \\ 1 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 1 \\ 4 & 3 \end{bmatrix}$

C. $\begin{bmatrix} 4 & 1 \\ 3 & 3 \end{bmatrix}$

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

Answer:

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4. The equation of tangent to the curve $y = x^3 - 6x^2 - 2x + 3$ at x=1 is:

A. x + 11y + 7 =0

B. x- 11y + 7 = 0

C. 11x + y + 7 = 0

D. 11x + y - 7 = 0

Answer:

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5. If A is a 3×3 non-singular matrix with det $\left(A^{-1}\right) = (\det A)^k$, then the value of k is :

A. -1

B. 0

C. 2

D. 3

Answer:

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6. The interval in which the function $f(x) = x^2 - 3x + 36$ is strictly increasing, is :

A. $\left(-\infty, \frac{3}{2}\right]$

B. $\left(\frac{3}{2}, \infty\right)$

C. $\left(-\infty, \frac{3}{2}\right)$

D. $\left[\frac{3}{2}, \infty\right)$

Answer:

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7. The corner points of the feasible region of a system of linear inequalities are (0, 0), (4,0), (3,9), (1, 5) and (0, 3). If the maximum value of

objective function, $Z = ax + by$ occurs at points $(3, 9)$ and $(1, 5)$, then the relation between a and b is:

A. $a-2b=0$

B. $2a-b=0$

C. $a + 2b =0$

D. $2a +b=0$

Answer:

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8. If a matrix has 12 elements, what are the possible orders it can have?

A. 4

B. 6

C. 10

D. 12

Answer:

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9. If $A = \begin{bmatrix} 1 & 2 & 5 \\ 1 & -1 & 1 \\ 2 & 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$ evaluate AB.

A. $\begin{bmatrix} 4 & 2 & 6 \\ -1 & 2 & 3 \\ 6 & 4 & 9 \end{bmatrix}$

B. $\begin{bmatrix} 4 & 1 & 13 \\ 8 & -1 & 5 \\ -10 & 11 & -25 \end{bmatrix}$

C. $\begin{bmatrix} -2 & 1 & 3 \\ 6 & 9 & 11 \\ -1 & -7 & 25 \end{bmatrix}$

D. $\begin{bmatrix} 2 & 9 & 13 \\ 4 & 7 & -11 \\ -10 & 11 & -20 \end{bmatrix}$

Answer: B

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10. If $x \in \left(\frac{\pi}{2}, \pi\right)$ and the matrix $\begin{bmatrix} 2\sin x & 3 \\ 1 & 2\sin x \end{bmatrix}$ is singular, then the value of x is :

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

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

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

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

Answer:

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11. The absolute minimum value of $f(x) = \sin x$ in $\left[0, \frac{3\pi}{2}\right]$ is :

A. -1

B. 0

C. 1

D. Does not exist

Answer:

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12. Let $A = \{1, 2, 3, 4\}, B = \{5, 6, 7\}$ and $f = \{(1, 6), (2, 7), (3, 5), (4, 6)\}$. The f 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:

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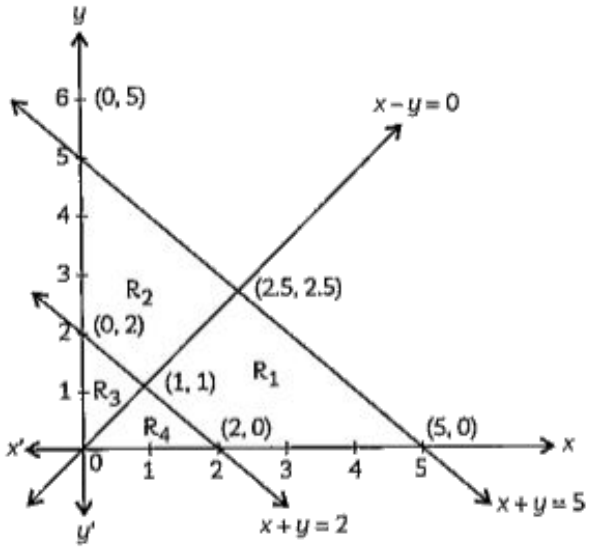
13. The corner points of the feasible region of the system of linear inequations $x + y \geq 2, x + y \leq 5, x - y \geq 0, x, y \geq 0$ are :



A. (0, 0), (2,0), (1, 1)

B. (0,2), (0,5), (1, 1), (2.5, 2.5)

C. (1, 1), (2.5, 2.5), (5,0), (2, 0)

D. (0,0), (1, 1), (0, 2)

Answer:

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14. The derivative of $(\sin x)^{\cos x}$ with respect to x, is:

A.

$$(\sin x)^{\cos x}\left[\cos^2 x \cos esx - \sin x \log(\sin x)\right]$$

B.

$$(\sin x)^{\cos x}\left[\sec^2 x \sin x + \cos x \log(\sin x)\right]$$

C.

$$(\sin x)^{\cos x}\left[\sec^2 x \tan x + \sin x \log(\sin x)\right]$$

D.

$$(six)^{\cos x}\left[\left(\sin^2 x \sec x + \cos x \log(\sin x)\right]\right.$$

Answer:

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15. The value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$ is:

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

B. π

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

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

Answer:

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16. The equation of normal to the curve $x = a\sin^3\theta$ and $y = a\cos^3\theta$ at $\theta = \frac{\pi}{4}$ is :

A. x-y = 0

B. 2x - y = 0

C. x-2y = 0

D. x + y = 0

Answer:

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17. The value of the determinant $\begin{vmatrix} p & p+1 \\ p-1 & p \end{vmatrix}$ is :

A. $2p^2 + 1$

B. $2p^2 - 1$

C. 0

D. 1

Answer:

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18. The derivative of $\cos^{-1}\left(2x\sqrt{1-x^2}\right)$ with respect to $\cos^{-1}x$ is :

A. -2

B. $-2\left(1-x^2\right)$

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

D. $-\sqrt{1-x^2}$

Answer:

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Sections B

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

A. $\frac{2^x}{1+4^x}\log 2$

B. $\frac{4^{x-1}}{1+4^x}\log 2$

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

D. $\frac{2^{x+1}}{1+4^x}\log 2$

Answer:

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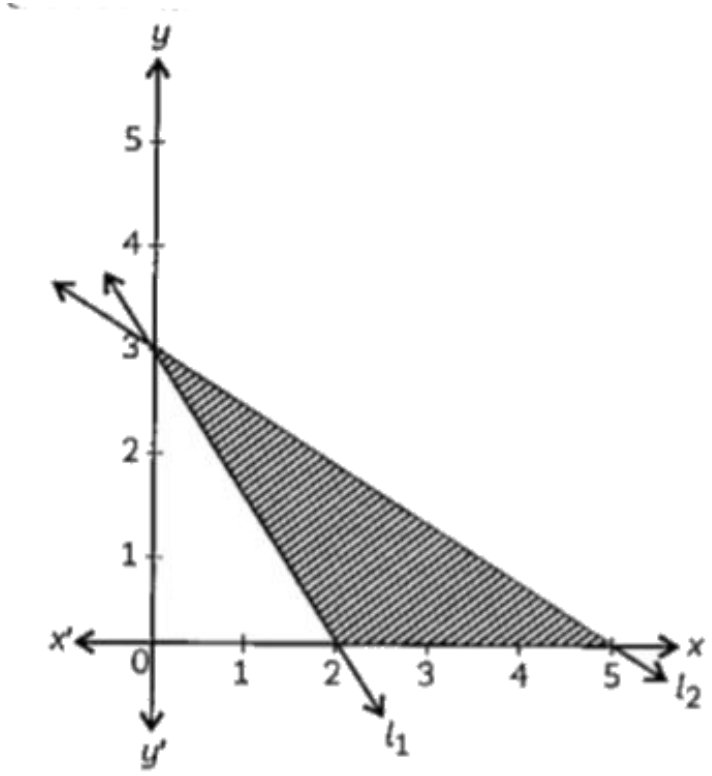
2. The feasible region of a sytem of linear inequations is shown below. If Z = 2x + y, then the minimum value of Z is:



A. 0

B. 3

C. 4

D. 10

Answer:

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3. The function $f(x) = x^2 - x + 1$ is :

A. increasing is $\left(\frac{1}{2}, \infty\right)$ and decreasing in $\left(-\infty, \frac{1}{2}\right)$

B. increasing in $\left(-\infty, \frac{1}{2}\right)$ and decreasing in $\left(\frac{1}{2}, \infty\right)$

C. strictly increasing in $\left(\frac{1}{2}, \infty\right)$ and strictly decreasing in $\left(-\infty, \frac{1}{2}\right)$

D. strictly increasing in $\left(-\infty, \frac{1}{2}\right)$ and strictly decreasing in $\left(\frac{1}{2}, \infty\right)$

Answer:

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4. If

$$A^{-1} = \begin{bmatrix} 0 & 1 & -2 \\ -2 & 9 & -23 \\ -1 & 5 & -13 \end{bmatrix}, B^T = [11 \; -5 \; -3]$$

and $X = A^{-1}B$, then X=

A. [1, 2,3]

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

C. [3,2,1]

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

Answer: D

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5. Let $A = \{1, 2, 3, \ldots\ldots, \}$ and the relation R defined as (a, b) R (c,d) if $a + d = b + c$ be an equivalence relation. Then, the equivalence class containing [(2,5)] is:

A. $\{(5, 2)\}$

B. $\{(5, 2), (3, 4), (4, 3)\}$

C.

$\{(1, 4), (2, 5), (3, 6), (4, 7), (5, 8), (6, 9)\}$

D. $\{(6, 3), (7, 4), (8, 5), (9, 6), (4, 1)\}$

Answer:

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6. The value of $\sin\left(\frac{\pi}{2} + 2\sin^{-1}(1)\right)$ is:

A. -1

B. 0

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

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

Answer:

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7. If A is a square matrix of order n×n such that

find the value of |5AadjA|

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8. The values of a and b if the function

$$f(x) = \begin{cases} x^2 + 3x + a, & x \leq 1 \\ bx + 2, & x > 1 \end{cases}$$ is

differentiable at x =1, are :

A. a = 3, b=5

B. a = 2,b=4

C. a = 4, b = 6

D. a = 5, b = 7

Answer:

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9. If $e^v + e^u = e^{v+u}$, then $\frac{du}{dv} =$

A. e^{u-v}

B. e^{v-u}

C. $-e^{u-v}$

D. $-e^{v-u}$

Answer:

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10. The corner points of a feasible region determined by a system of linear inequations are $(0, 0), (4, 0), (5, 2), (2, 2)$ and (0, 1). If the

objective function is $Z = x + y$, then maximum of

Z occurs at:

A. (4,0)

B. (5,2)

C. (2,2)

D. (0,1)

Answer:

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11. The function $f:(-\infty, 0) \to (-1, 0)$ defined by $f(x) = \dfrac{x}{1+|x|}$ is :

A. many-one

B. into

C. one-one

D. bijective

Answer:

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12. The principal value of $\sec^{-1}\left(-\frac{2}{\sqrt{3}}\right)$ is :

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

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

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

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

Answer:

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13. If $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$, the

the respective values of a and b are:

A. $-2, \ -1$

B. $-1, 2$

C. $1, \ -2$

D. $2, 1$

Answer:

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14. If A is a square matrix of order 3 such that $|adjA| = 64$, then the value of $|A|$ is :

A. ± 4

B. ± 6

C. ± 8

D. 4

Answer:

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15. Which of the following functions is decreasing on $\left(0, \frac{\pi}{2}\right)$?

A. $\sin 2x$

B. $\tan x$

C. $\cos x$

D. $\cos 3x$

Answer:

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16. The local maximum value of the function $f(x) = \frac{(x-1)(x-6)}{x-10}$ is:

A. 1

B. 5

C. 12

D. 25

Answer:

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17. If $|A| = \begin{vmatrix} a & 4 \\ 4 & a \end{vmatrix}$ and $|A^3| = 729$, then the value of a is :

A. ± 6

B. ± 5

C. ± 4

D. ± 3

Answer:

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18. If $y = 10^{10^x}$ then $\frac{dy}{dx}$ is :

A. $10^{10^x} \log 10$

B. $10^{10^x} (\log 10)^2$

C. $10^{10^x} 10^x (\log 10)^2$

D. $10^{10^x} 10^x \log 10$

Answer:

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19. Asha and Kiran went to a market to buy some stationary. Asha bought 5 pens and 2 notebooks, while Kiran bought 3 pen and 4 notebooks. After returning home, they write a matrix to compare the number of items bought by them.

The matrix formed is $A = \begin{bmatrix} 5 & 2 \\ 3 & 4 \end{bmatrix}$

The cofactor matrix of A is:

A. $\begin{bmatrix} 4 & -3 \\ -2 & 5 \end{bmatrix}$

B. $\begin{bmatrix} -4 & 3 \\ 2 & -5 \end{bmatrix}$

C. $\begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$

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

Answer:

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Sections C

1. Consider the non-empty set consisting of children in a family and a relation R defined as aRb, if a is brother of b. Then, R is

A. symmetric but not transitive.

B. transitive but not symmetric.

C. neither symmetric nor transitive.

D. both symmetric and transitive.

Answer:

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2. If X is a symmetric matrix, then Y'XY is:

A. a symmetric matrix.

B. a skew-symmetric matrix.

C. B

D. B'

Answer:

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3. If $A = \begin{bmatrix} 2 & 1 \\ 9 & 3 \end{bmatrix}$ and $A^2 - 5A + 7I = O$, then $A^{-1} =$

A. $\begin{bmatrix} 3 & -1 \\ 9 & 2 \end{bmatrix}$

B. $\frac{1}{7}\begin{bmatrix} 3 & -1 \\ -9 & 2 \end{bmatrix}$

C. $\frac{1}{14}\begin{bmatrix} 3 & -1 \\ 9 & 2 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 1 \\ 9 & 2 \end{bmatrix}$

Answer: B

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4. Let the $f: R \to R$ be defined by $f(x) = 2x + \cos x$. Then f:

A. has a minimum at $x = \pi$

B. has maximum at x = 0.

C. is a decreasing function.

D. is an increasing function.

Answer:

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5. The corner points of the feasible region determined by the system of linear constraints are (0, 0), (0, 40). (20, 40), (60, 20). (60, 0). "The objective function is $Z = 4x + 3y$.

Compare the quantity in Column A and Column

B.

Column A	Column B
Maximum of Z	325

A. The quantity in column A is greater.

B. The quantity in column B is greater.

C. The two quantities are equal.

D. The relationship can not be determined on the basis of the information supplied.

Answer:

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6. The'derivative of x w.r.t. θ is: x = sinθcosθ

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7. The derivative of y =$x^2 \log x$ w.r.t. x is :

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8. y = cosθ and x = sinθ $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ is :

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