MATHS

BOOKS - EDUCART PUBLICATION

SAMPLE PAPER 3

Section A

1. The range of the principal value branch of the function y= sec^(-1)x is .....

A. $[0, \pi]$

B. $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

C. $[0, \pi] - \left\{\frac{\pi}{2}\right\}$

D. $(0, \pi)$

Answer: B

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2. If $A = \begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$ is a skew-symmetric matrix, then the value of $(a+b+c)^2$ is:

A. 0

B. 1

C. 4

D. 9

Answer: A

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3. If A is a non-singular square matrix of order 3 such that A^2 = 3A, then value of $|A|$ is

A) (-3)

B) 3

C) 9

D) 27

A. 3

B. 9

C. 6

D. 12

Answer: B

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4. The function $f: R \to R$ given by f(x) = |x + 2| is:

A. continuous as well as differentiable at x=-2.

B. continuous but not differentiable at x=-2.

C. differentiable but not continuous at x = -2.

D. neither continuous nor differentiable at x = -2.

Answer: B

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5. The interval in which the function f given by $f(x) = xe^{-x}$ is strictly increasing, is:

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

B. (0,1)

C. $(-\infty, 1)$

D. $(1, \infty)$

Answer: C

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6. The relation in the set A = {1, 2, 3} given by R = {(2,3),(3,2), (1,1)} is:

A. reflexive

B. symmetric

C. transitive

D. equivalence

Answer: B

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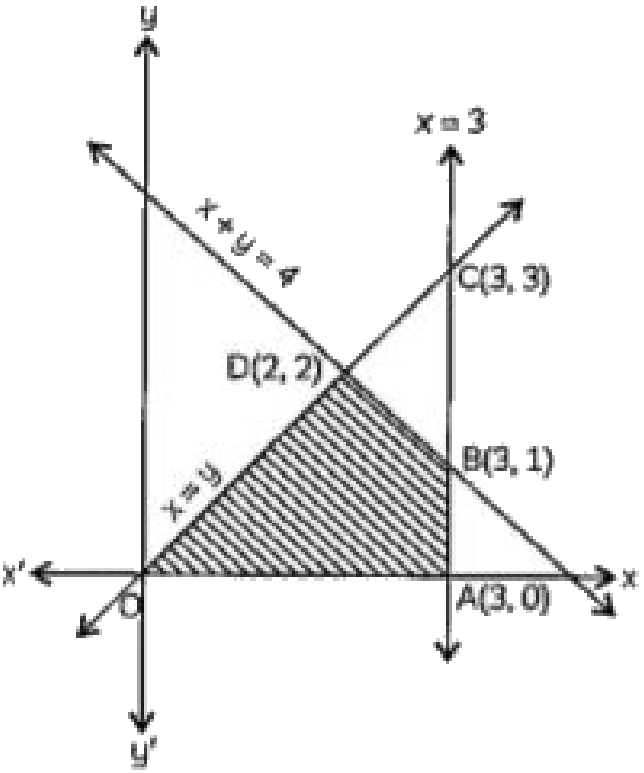
7. In the given figure, if the shaded region is the feasible region and the objective function is $z = x - 2y$, the minimum

value of Z occurs at:



A. O

B. B

C. C

D. D

Answer: D

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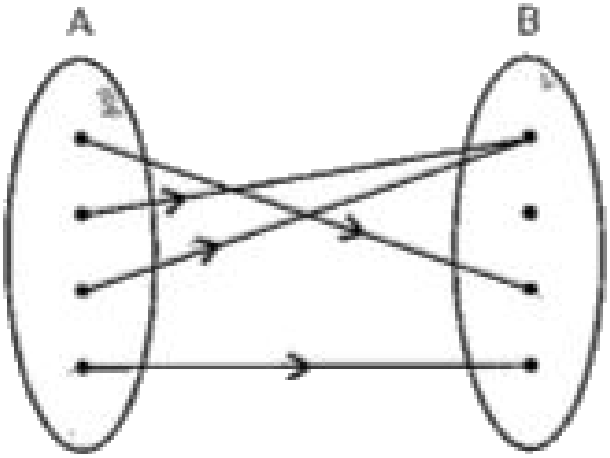
8. The function $f: A \to B$, defined by a mapping below, is:



A. one-one

B. onto

C. into

D. bijective

Answer: C

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9. Derivative of $\sec^2\left(x^2\right)$ with respect to x^2 is:

A. $2x\sec^2 x^2\tan x^2$

B. $x\sec^2 x^2\tan x^2$

C. $2\sec^2 x^2\tan x^2$

D. $\sec^2 x\tan x^2$

Answer: C

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10. Find the slope of the tangent to the curve $y = 3x^4 - 4x$ at $x = 4$.

A. 764

B. $-\frac{1}{764}$

C. 752

D. $-\frac{1}{752}$

Answer: A

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11. The value of $\cot^{-1}\left(\frac{\cot(7\pi)}{4}\right)$ is:

A. $\frac{7\pi}{4}$

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

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

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

Answer: D

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12. If $A = \begin{bmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{bmatrix}$, then $A^T A =$

A. $\begin{bmatrix} \sin^2 x & \cos^2 x \\ -\cos^2 x & \sin^2 x \end{bmatrix}$

B. $\begin{bmatrix} 1 & 2\sin x \cos \\ 2\sin x \cos x & 1 \end{bmatrix}$

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

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

Answer: D

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13. The cofactor of 2 in the determinant

$$\begin{bmatrix} 3 & 4 & -1 \\ 2 & 4 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$ is:

A. 2

B. -2

C. -4

D. 4

Answer: B

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14. If y = sin x, then $\frac{d^2y}{dx^2} =$

A. $-y$

B. y^2

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

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

Answer: A

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15. If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$, then the value of x is:

A. ± 2

B. ± 4

C. ± 6

D. ± 8

Answer: C

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16. Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as $a\,R\,b$ if a is congruent to b for all $a,\ b \in T$. Then, R is (a) reflexive but not symmetric (b) transitive but not symmetric (c) equivalence (d) none of these

A. Reflexive but not transitive

B. Transitive but not symmetric

C. Symmetric but not reflexive

D. Equivalence

Answer: D

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17. If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, then A^3

A. 3A

B. $-3A$

C. 4A

D. $-4A$

Answer: C

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18. Show that the function f given by $f(x) = x^3 - 3x^2 + 4x, x \in R$is strictly increasing on R.

A. $(0, \infty)$

B. $(- \infty, 0)$

C. R

D. N

Answer: C

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19. The adjoint of matrix $\begin{bmatrix} 1 & 1 \\ 5 & 7 \end{bmatrix}$ is:

A. $\begin{bmatrix} 7 & 5 \\ 1 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 5 \\ 1 & -7 \end{bmatrix}$

C. $\begin{bmatrix} 7 & -1 \\ -5 & 1 \end{bmatrix}$

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

Answer: C

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20. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$ has

A. two points of local maximum

B. two points of local minimum

C. one maxima and one minima

D. no maxima or minima

Answer: C

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Section B

1. Three friends A, B and C decided to donate some books, penciles and chocolates to poor children. For this purpose, they went to a store. A purchased 12 dozen books, 5 dozen pencils and 6 dozen chocolates. B purchased 10 dozen books, 6 dozen pencils and 7 dozen chocolates. C purchased 11 dozen books, 13 dozen pencils and 8 dozen chocolates. A book costs Ru 40, a pencil costs Ru 12 and a chocolate costs Ru 3. Based on the above information, answer the following question.

If X represents the matrix formed by the number of items purchased by the three friends and Y represents the matrix formed by the costs of each item, then XY equals:

A. $\begin{bmatrix} 5224 \\ 6696 \\ 7650 \end{bmatrix}$

B. $\begin{bmatrix} 6312 \\ 5192 \\ 7500 \end{bmatrix}$

C. $\begin{bmatrix} 6696 \\ 5916 \\ 7440 \end{bmatrix}$

D. $\begin{bmatrix} 5400 \\ 6698 \\ 7404 \end{bmatrix}$

Answer: C

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2. The slope of normal to the curve $y = \frac{x-1}{x-2}, x \neq 2, atx = 10$ is:

A. 10

B. 64

C. 100

D. 8

Answer: B

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3. Let $A = \begin{vmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{vmatrix}$ If $\left|A^2\right| = 25$, then $|\alpha|$ equals :

A. $\frac{1}{5}$

B. $-\frac{1}{5}$

C. $\pm\frac{1}{5}$

D. Not defined

Answer: A

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4. The function f(x)=x^x has a stationary point at

A. e

B. $\frac{1}{e}$

C. e^e

D. 1

Answer: B

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5. The value of $\sin^{-1}\left(\cos.\ \frac{53\pi}{5}\right)$ is

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

B. $\frac{53\pi}{5}$

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

D. $-\frac{3\pi}{5}$

Answer: C

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6. Relation R defines on the set of natural numbers N such that $R = \{(a, b) : a$ is divisible by $b\}$, then show that R is reflexive and transitive but not symmetric.

A. an equivalence relation.

B. reflexive,symmetric but not transitive.

C. symmetric, transitive but not reflexive.

D. reflexive and transitive but not symmetric.

Answer: D

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7. The value of k, so that the function $f(x) = \{(kx) - 5k, x \leq 2), (3, x > 2)$ is continuous at x =

2, is:

A. -1

B. 2

C. 5

D. -7

Answer: A

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8. If $x + y = 8$, then the maximum value of xy is (a) 8 (b) 16 (c) 20 (d) 24

A. 8

B. 16

C. 20

D. 24

Answer: B

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9. The curve $x^3 - 3xy^2 + 2 = 0$ and $3x^2y - y^3 - 2 = 0$ cut at an angle of

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

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

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

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

Answer: C

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10. The corner points of the feasible region of an LPP are (0,0),(0,8),(2,7),(5,4) and (6,0). The maximum value of the objective function Z = 3x + 2y is:

A. 20

B. 23

C. 27

D. 18

Answer: B

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11. Find two positive numbers whose sum is 15 and the sum of whose squares is minimum.

A. $\frac{15}{2}, \frac{15}{2}$

B. 9,6

C. $\frac{13}{2}, \frac{17}{2}$

D. 11,4

Answer: A

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12. If $A^2 + A + I = O$, then $A^{-1} =$

A. $A^2 - I$

B. $-(I + A)$

C. $\frac{I + A}{A}$

D. A^2

Answer: B

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13. If $f(x) = \sqrt{\frac{\sec x - 1}{\sec x + 1}}$, then $f'\left(\frac{\pi}{3}\right) =$

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

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

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

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

Answer: C

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14. The maximum value of sin x. cos x is :

A. $\frac{1}{4}$

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

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: B

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15. If $a_{ij} = \left|2i + 3j^2\right|$, then matrix $A_{2\times 2} = \left[a_{ij}\right]$ will be:

A. $\begin{bmatrix} 5 & -14 \\ 7 & 16 \end{bmatrix}$

B. $\begin{bmatrix} 5 & 14 \\ -7 & 16 \end{bmatrix}$

C. $\begin{bmatrix} 5 & 14 \\ 7 & 16 \end{bmatrix}$

D. $\begin{bmatrix} 5 & 14 \\ 7 & -16 \end{bmatrix}$

Answer: C

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16. A relation R in S = {1, 2, 3} is defined as R = {(1, 1),(2,2),(1,2), (3,3)}. Which of the following elements (s) must be added to make R an equivalence relation ?

A. (2,1),(2,3)

B. (3,2),(2,3)

C. (2,1)

D. (1,3)

Answer: C

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17. The equation of tangent to the curve y = 2 $\sin 3x$ at $x = \frac{\pi}{6}$ is:

A. x = 2

B. x + y = 2

C. x - y = 2

D. $y = 2$

Answer: D

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18. The area of triangle formed by the points $(-1, -1), \left(\frac{1}{2}, \frac{1}{2}\right)$ and (4, 7) is:

A. $\frac{7}{2}$ sq.units

B. $\frac{9}{4}$ sq. units

C. 8 sq. units

D. 2 sq. units

Answer: B

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19. The points of local maxima or local minima of the function $f(x) = x^3 + x^2 + x + 1$ are:

A. 0, 1, 1

B. $-1, 0, 1$

C. $-1, \ -1, 0$

D. Does not exist

Answer: D

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20.

If $A = \begin{bmatrix} 1 & -2 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$ then $A(\text{ adj } A)$ is equals to $-$

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

B. $\begin{bmatrix} 8 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 0 & 8 \\ 0 & 8 & 0 \\ 8 & 0 & 0 \end{bmatrix}$

D. Data insufficient

Answer: B

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Section C

1. $\sin\left(2\sin^{-1}\sqrt{\frac{63}{65}}\right)$ is equal to

A. $\sqrt{\frac{63}{65}}$

B. $\left(\sqrt{\frac{2}{65}}\right)$

C. $\frac{2\sqrt{126}}{65}$

D. $2\frac{\sqrt{130}}{63}$

Answer: C

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2. If $x = 2\cos\theta - \cos 2\theta, y = 2\sin\theta - \sin 2\theta, then \frac{dy}{dx} =$

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

B. 1

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

D. $\sqrt{2}+1$

Answer: A

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3. If $A=\begin{bmatrix}2 & -1\\ 5 & 3\end{bmatrix}$ then $A^{-1}=$

A. $-\frac{1}{11}\begin{bmatrix}3 & -1\\ 5 & 2\end{bmatrix}$

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

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

D. $\frac{1}{11}\begin{bmatrix}3 & 1\\ -5 & 2\end{bmatrix}$

Answer: D

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4. Let R be a relation in a set N of natural numbers defined by R = {(a,b) = a is a mulatiple of b}. Then:

A. $(2, 5) \in R$

B. $(-2, 4) \in R$

C. $(3, 6) \in R$

D. $(10, 5) \in R$

Answer: C

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5. If sin^(2) x + cos^(2) y = 1 , " then " (dy)/(dx)` is equal to

A. $-\frac{\sin^2 x}{\cos^2 y}$

B. $\frac{\sin x}{\sin y}$

C. $\frac{\sin 2x}{\sin 2y}$

D. $\frac{\sin^2 2x}{\cos^2 2y}$

Answer: C

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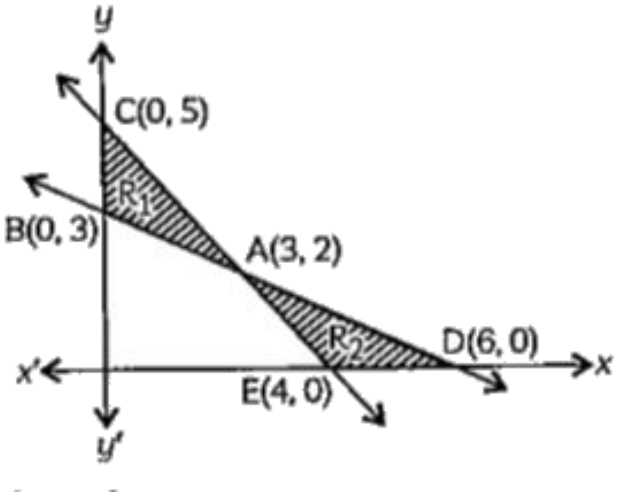
6. The feasible regions for two LPP is show in the following figure.

Based on the given information, answer the following questions:

If R_1 is the feasible region, and the ojective function is

$Z_1 = 2x - y$, then the maximum value of Z_1 occurs at:



A. (0,5)

B. (0,3)

C. (3,2)

D. (6,0)

Answer: C

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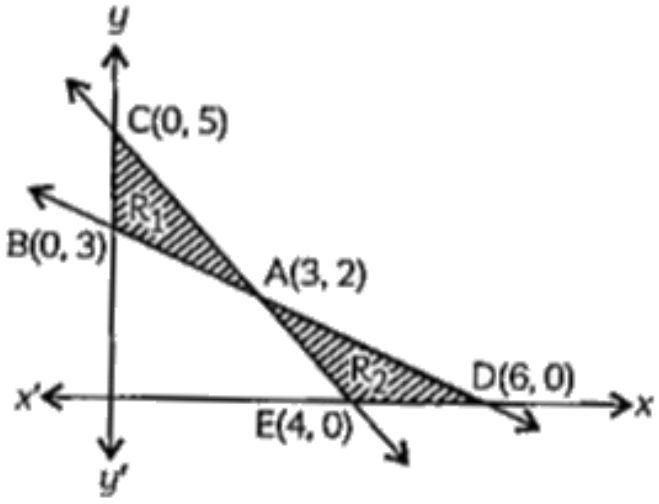
7. The feasible regions for two LPP is show in the following figure.

Based on the given information, answer the following questions:

If R_2 is the feasible region and the objective function is $Z_2 = 4x + 3y,$ then the minimum value of Z_2 occurs at:



A. (3,2)

B. (4,0)

C. (6,0)

D. (0,3)

Answer: B

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