MATHS

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SAMPLE PAPER 2

Mathematics Section A

1. The value of $\tan^{-1}\left(\sqrt{2}\sin\frac{3\pi}{4}\right)$ is

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

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

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

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

Answer: C

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2. Evaluate $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$

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

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

C. 0

D. 1

Answer: C

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3. If $y = x(x-3)^2$ decreases for the values of x given by

A. $1 < x < 3$

B. $x < 0$

C. $x > 0$

D. $0 < x < \frac{3}{2}$

Answer: A

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4. At (0,0) ,the curve $y = x^{1/5}$ has

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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5. $f: R \to R: f(x) = \cos x$ is

A. one - one

B. mony - one

C. onto

D. bijective

Answer: B

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6. If $f(x) = \begin{cases} k(x^2 - 2x), & \text{If } x \leq 0 \\ 4x + 1, & \text{If } x > 0 \end{cases}$ then which one of the following statement is correct

A. f(x) is continuous at x = 0 for any value of k

B. f (x) is discontinuous at x = 0 for any value of k

C. f(x) is discontinuous at x = 1 for any value of k

D. f (x) is continuous at x = 0 and k = 1

Answer: B

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7. Total number of possible matrices of 3×3 with each entry - 1 or 2 is

A. 9

B. 36

C. 81

D. 512

Answer: A

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8. The common region determined by all the linear constraints of a LPP is called the . . . . . region

A. bounded

B. unbounded

C. feasible

D. concave

Answer: C

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9. Show that the relation R defined on the set A of all triangles in a plane as $R = \{(T_1, T_2) : T_1$ is similar to $T_2)$ is an equivalence relation. Consider three right angle triangle T_1 with sides $3, 4, 5$; T_2 with sides $5, 12, 13$ and T_3 with sides 6, 8, 10. Which triangles among T_1, T_2 and T_3 are related?

A. T_1, T_2

B. T_1, T_3

C. T_3, T_2

D. T_1, T_2, T_3

Answer: B

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10. If $A = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$ then find the value of $(A + 2B)$

A. $\begin{bmatrix} -4 & 5 \\ 1 & 6 \end{bmatrix}$

B. $\begin{bmatrix} -4 & 1 \\ 5 & 6 \end{bmatrix}$

C. $\begin{bmatrix} -4 & 6 \\ 5 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 5 & 6 \\ 1 & -4 \end{bmatrix}$

Answer: A

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11. The slope of the tangent to the curve $y = x + \sin x \cos x$ at $x = \frac{\pi}{2}$ is

A. 0

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

C. 1

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

Answer: A

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12. $\sin\left(\tan^{-1} x\right), |x| \leq 1$ is equal to :

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

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

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

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

Answer: D

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13. If A is a 3 × 3 invertible matrix, then what will be the value of k if det(A–1) = (det A)k .

A. 1

B. 2

C. -1

D. -2

Answer: C

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14. If $y + \sin y = \cos x$, $then \frac{dy}{dx}$ is equal to

A. $\frac{\sin x}{1 - \cos y}$

B. $-\frac{\sin x}{1 + \cos y}$

C. $-\frac{\cos x}{1 + \sin y}$

D. $\frac{\cos x}{1 - \sin y}$

Answer: B

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15. The derivative of $\cos^{-1}\left(2x^2 - 1\right)$ w.r.t. $\cos^{-1}$ is

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

B. 2

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

D. $1-x^2$

Answer: B

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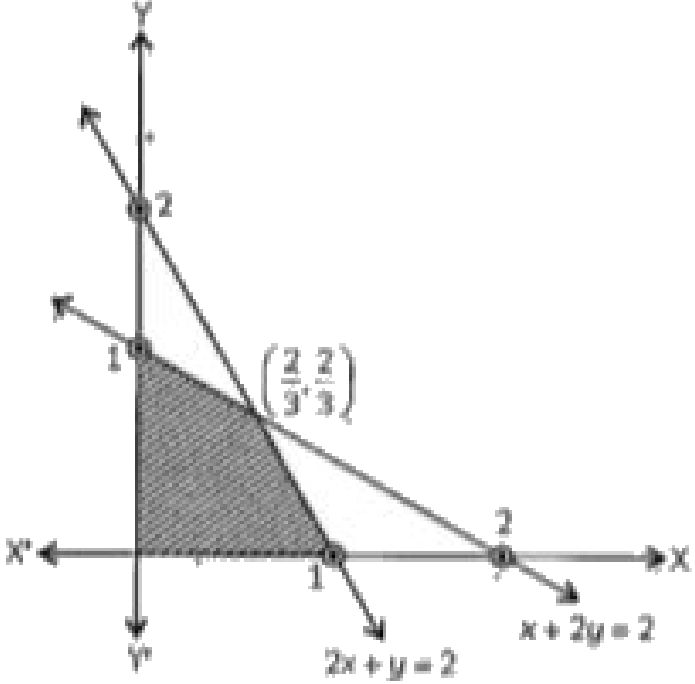
16. The maximum value of objective function $Z=3x+y$ under given feasible region is



A. 2

B. 3

C. 4

D. 5

Answer: B

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17. The function $g(x) = x^x$ has a critical point at

A. x = e

B. x = 1

C. $x = \frac{1}{e}$

D. $x = \sqrt{6}$

Answer: C

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18. If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix then x is

A. $-\frac{12}{5}$

B. -7

C. $-\frac{8}{13}$

D. $-\frac{25}{13}$

Answer: D

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19. Which of following is true if $B = \begin{bmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{bmatrix}$ and $A = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$?

A. Only BA is defined

B. Only AB is defined

C. Both AB and BA are defined

D. Both AB and BA are not not defined

Answer: C

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20. The maximum value of function defined as $f(x) = \sin 2x + 5$ is

A. 2

B. 4

C. 6

D. 8

Answer: C

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Mathematics Section B

1. Corner poins of the feasible region determned by the system of linear constrainsts are (0,3), (1,1), and (3,0). Let Z=px+qy. Where $p, q < 0$ Condition on p and q, so that the minimum f Z occurs at (3,0) and (1,1) is

A. p = q

B. $p = \frac{q}{2}$

C. p = 2 q

D. p = 3q

Answer: B

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

A. minimum

B. maximum

C. zero

D. neither maximum nor minimum

Answer: D

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3. If $v = \log\left(1 + x^2\right)$ and $u = x - \tan^{-1} x$ then , $\frac{du}{dv}$ is equal to

A. $e^x - y$

B. $e^x - 1$

C. 2/x

D. $x^2 - 1$

Answer: C

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4. If $\begin{bmatrix} 1 & 2 \\ -2 & -b \end{bmatrix} + \begin{bmatrix} a & 4 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 0 \end{bmatrix}$, then $a^2 + b^2$ is equal to

A. 10

B. 12

C. 20

D. 22

Answer: C

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5. A relation R on A is as follows

R = { (0,0),(0,1),(0,3),(1,0),(1,1),(2,2),(3,0),(3,3)} for A = {0,1,2,3} . Then R is

A. Reflexive but not symmetric

B. symmetric and transitive

C. Reflexive symmetric but not transitive

D. Eqquivalence

Answer: D

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6. The value of $\tan^2\left(\sec^{-1}2\right) + \cot^2\left(\cos ec^{-1}3\right)$ is equal to

A. 5

B. 11

C. 13

D. 15

Answer: B

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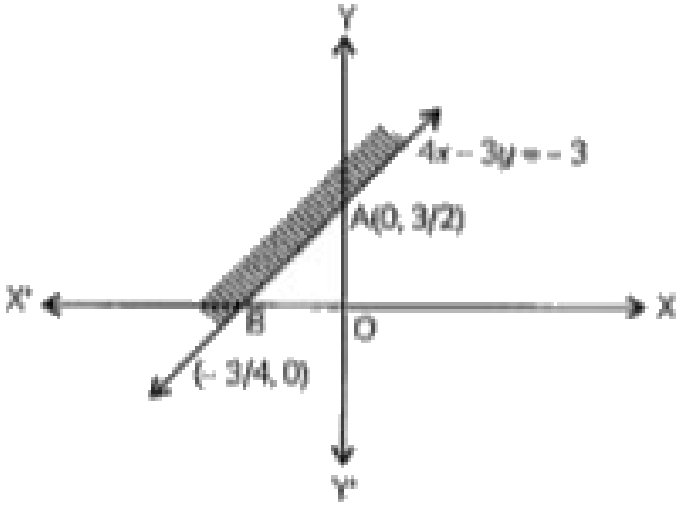
7. Shaded region is represented by



A. $4x - 2y \geq 3$

B. $4x - 2y \geq -3$

C. $4x - 2y \leq 3$

D. $4x - 2y \leq -3$

Answer: D

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8. If matrix P $= \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $kP = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ where k, a and b are constants, then the values of k, a, b respectively are

A. $6, 4, 9$

B. $-6, 4, 9$

C. $6, -4, -9$

D. $-6, -4, -9$

Answer: D

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9. The height 'h' and radius 'r' of a right circular cylinder which is open at the top and has a given surface area, will have the greatest volume if

A. 2 h = r

B. h = 4r

C. h = r

D. h = 2 r

Answer: C

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10. For a function y = x cos x then $\frac{d^2y}{dx^2}$ is equal to

A. $-x\cos x - 2\sin x$

B. $x\cos x + 2\sin x$

C. $x\sin x + \cos x$

D. $-x\sin x + \cos x$

Answer: A

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11. The minor M_{31} if $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ is

A. $-c(a^2 - b^2)$

B. $x(b^2 - a^2)$

C. $c(a^2 + b^2)$

D. $c(a^2 - b^2)$

Answer: D

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12. If the area of triangle with vertices (-3,0), (3,0) and (0,k) is 9 sq . units then the value of k is

A. 9

B. 6

C. 3

D. -9

Answer: C

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13. If A ={ 1, 2, 3,. . . , 10} R : A to A $R = \{(a, b) : |a - b|$ is a multiple of 3} is an equivalence relation, then the equivalence class [1] is

A. {1,4,7}

B. {1,3,6,9}

C. {1,4,7,10}

D. {1,2,3,4}

Answer: C

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14. Maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is

A. 0

B. 12

C. 16

D. 32

Answer: B

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15. For the function $f(x) = 2x^3 - 3x^2 - 12x + 4$ which of the following statement is correct

A. f (x) has one maxima and one minima

B. f (x) has to points of local maximum

C. f (x) has two points of local minimum

D. f(x) has no maximu or minima

Answer: A

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16. If $f(X) = \begin{cases} ax + b & \text{if } x \leq 1 \\ 2 & \text{if } x > 1 \end{cases}$ is continuous at x = 1, then the relation between a and b is

A. a + b = 1

B. a = 6

C. a + b = 2

D. a - b = 2

Answer: C

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17. If A is 3×3 matrix such that |A| = 8, then |3A| equal is

A. 8

B. 24

C. 64

D. 216

Answer: D

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18. The principal value of $\tan^{-1}\sqrt{3} \div \cos^{-1}\left(-\frac{1}{2}\right)$ is

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

B. 0

C. $\frac{1}{3}$

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

Answer: D

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19. If $f'(1) = 2$ and $v = f(\log_e x)$, then $\frac{dv}{dx}$ is for x = e

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

B. 0

C. e

D. 1

Answer: A

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Mathematics Section C

1. The feasible region of a LPP under the constraints $x - y \leq 1, x + y \geq 3, x \geq 0, y \geq 0$

A. is bounded and lies in first quadrant

B. Is unbounded and lies first quadrant

C. does not exist

D. is not in the first quadrant

Answer: B

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2. If $\begin{bmatrix} 1 & 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = 0$, then the value of x is

A. 0

B. -1

C. -3

D. 3

Answer: B

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3. A music concert is organised in a stadium that has a capacity of 36000 people . With ticket price of Rs. 10 the average attendance has been 24000 . Some financial expert estimated that price of a ticket should be determined by the function $p(x) = 15 - \frac{x}{3000}$, where x is the number of tickets sold

Based on the above information, answer the following questions

The value of x for which revenue is maximum , is

A. 25000

B. 22500

C. 21000

D. 20000

Answer: B

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4. For $f: A \to A$ and $A = \{1, 2, 3, 4\}, f = \{(1, 2), (2, 3), (3, 4), (4, 1)\}$ is

A. injective only

B. surjective only

C. Bijective

D. Neither injective nor subjective

Answer: C

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5. If $|A|=3$ and $A^{-1} = \begin{bmatrix} 3 & -1 \\ \frac{-5}{3} & \frac{2}{3} \end{bmatrix}$ then adjA=?

A. $\begin{bmatrix} 9 & -5 \\ -3 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 9 & 2 \\ -5 & -3 \end{bmatrix}$

C. $\begin{bmatrix} 9 & -3 \\ 2 & -5 \end{bmatrix}$

D. $\begin{bmatrix} 9 & -3 \\ -5 & 2 \end{bmatrix}$

Answer: D

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6. Harsh made a piggy bank for himself using clay . If the shape of the bank is based on the function f (x)= | x - 4|+ | x - 5 | where f (x) represents the height of the bank

Based on the above information , answer the following questions :

For $x > 6$ the value of the function f (x) is

A. 1

B. -1

C. $2x - 9$

D. 2 x + 1

Answer: C

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7. Harsh made a piggy bank for himself using clay . If the shape of the bank is based on the function f (x)= | x - 4|+ | x - 5 | where f (x) represents the height of the bank

At x = 4 . 5 the value of the functions f (x) is

A. 1

B. -1

C. 0

D. 10

Answer: A

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8. Harsh made a piggy bank for himself using clay . If the shape of the bank is based on the function f (x)= | x - 4|+ | x - 5 | where f (x) represents the height of the bank

The value of f'(x) at x = 4 is :

A. -2

B. 1

C. -1

D. Not defined

Answer: D

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9. Harsh made a piggy bank for himself using clay . If the shape of the bank is based on the function f (x)= | x - 4|+ | x - 5 | where f (x) represents the height of the bank

For $x \in (4, 5)$ the value of the functions f (x) is

A. $2x - 9$

B. 1

C. -1

D. 2 x + 1

Answer: B

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10. Harsh made a piggy bank for himself using clay . If the shape of the bank is based on the function f (x)= | x - 4|+ | x - 5 | where f (x) represents the height of the bank

Based on the above information , answer the following questions :

The function | x| is

A. continuous everywhere but not differentiable

B. both continuous and differentiable

C. not continuous but differentiable everywhere

D. neither continuous nor differentiable

Answer: A

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