Mathematics Sample Paper - 2

Maths

Q.No. 1 $\int \frac{dx}{\sin(x-a)\sin(x-b)}$ **is equal to**

(A) $\sin(b-a)\log\left|\frac{\sin(x-b)}{\sin(x-a)}\right| + C$

(B) $\csc(b-a)\log\left|\frac{\sin(x-a)}{\sin(x-b)}\right| + C$

(C) $\csc(b-a)\log\left|\frac{\sin(x-b)}{\sin(x-a)}\right| + C$

(D) $\sin(b-a)\log\left|\frac{\sin(x-a)}{\sin(x-b)}\right| + C$

Q.No. 2 Let T be the set of all triangles in the Euclidean plane, and let a relation R on T be defined as aRb if a is congruent to b $\forall$ a, b $\in$ T. Then R is

(A) reflexive but not symmetric

(B) transitive but not symmetric

(C) equivalence

(D) None of these

Q.No. 3 The magnitude of the vector $6\hat{i} + 2\hat{j} + 3\hat{k}$ **is**

(A) 5

(B) 7

(C) 12

(D) 1

Q.No. 4 If P(A) = 0.4, P(B) = 0.8 and P(B | A) = 0.6, then P(A **U** B) is equal to

(A) 0.24

(B) 0.3

(C) 0.48

(D) 0.96

Q.No. 5 Distance of the point (α,β,γ) from y-axis is

(A) β

(B) $|\beta|$

(C) $|\beta| + |v|$

(D) $\sqrt{\alpha^2 + y^2}$

Q.No. 6 If $f(x) = x^2 \sin \frac{1}{x}$, where $x \neq 0$ then the value of the function f at x = 0, so that the function is continuous at x = 0, is

(A) 0

(B) -1

(C) 1

(D) None of these

Q.No. 7 Find the value of λ such that the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal

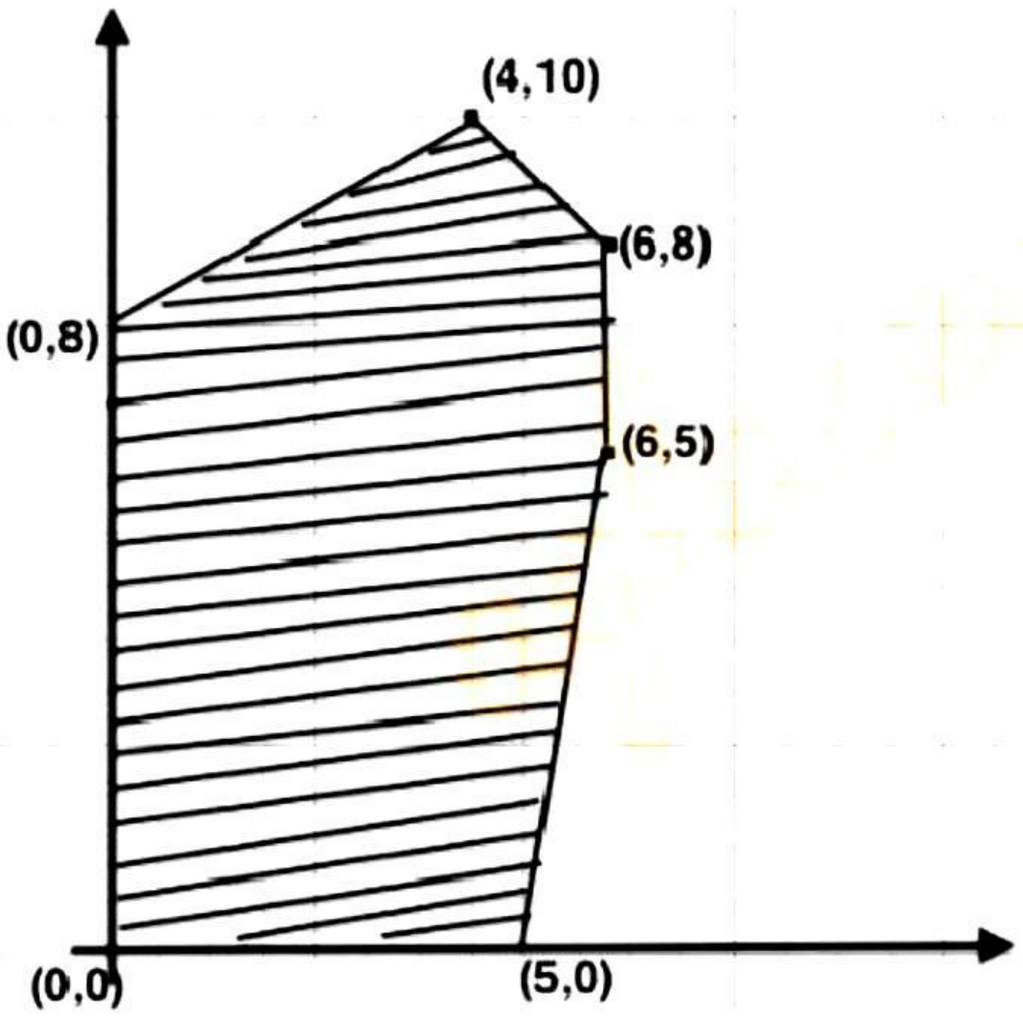
(A) 0

(B) 1

(C) $\frac{3}{2}$

(D) $-\frac{5}{2}$

Q.No. 8 The feasible solution for a LPP is shown in Figure. Let Z = 3x – 4y be the objective function. Minimum of Z occurs at



(A) (0, 0)

(B) (0, 8)

(C) (5, 0)

(D) (4, 10)

Q.No. 9 The area of the quadrilateral ABCD, where A(0,4,1), B (2, 3, –1), C(4, 5, 0) and D (2, 6, 2), is equal to

(A) 9 sq. units

(B) 18 sq. units

(C) 27 sq. units

(D) 81 sq. units

Q.No. 10 P is a point on the line segment joining the points (3, 2, −1) and (6, 2, −2). If x co-ordinate of P is 5, then its y co-ordinate is

(A) 2

(B) 1

(C) -1

(D) -2

Q.No. 11 The corner points of the feasible region determined by the following system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let Z = px + qy, where p, q > 0. Condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20) is:

(A) p = q

(B) p = 2q

(C) q = 2p

(D) q = 3p

Q.No. 12 A and B are events such that P(A) = 0.4, P(B) = 0.3 and P(A ∪ B) = 0.5. **Then $P(B' \cap A)$ equals**

(A) $\frac{2}{3}$

(B) $\frac{1}{2}$

(C) $\frac{3}{10}$

(D) $\frac{1}{5}$

Q.No. 13 The area of the region bounded by the curve $y = \sqrt{16 - x^2}$ **and x -axis is**

(A) 8 sq units

(B) 20π sq units

(C) 16π sq units

(D) 256π sq units

Q.No. 14 The value of $\cos^{-1}\left(\cos\frac{3\pi}{2}\right)$ is equal to

(A) $\frac{\pi}{2}$

(B) $\frac{3\pi}{2}$

(C) $\frac{5\pi}{2}$

(D) $\frac{7\pi}{2}$

Q.No. 15 The order of the differential equation of all circles of given radius 'a' is:

(A) 1

(B) 2

(C) 3

(D) 4

Q.No. 16 If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is

(A) 3

(B) ± 3

(C) ± 6

(D) 6

Q.No. 17 Let f : R $\rightarrow$ R be defined by $f(x) = \frac{1}{x} \quad \forall x \in \mathbf{R}$. Then f is

(A) one-one

(B) onto

(C) bijective

(D) f is not defined

Q.No. 18 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 A	**Column B**
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

Q.No. 19 If $f(x) = \begin{cases} mx + 1 & , \text{ if } x \leq \frac{\pi}{2} \\ \sin x + n, & \text{if } x > \frac{\pi}{2} \end{cases}$, is continuous at $x = \frac{\pi}{2}$, then

(A) m = 1, n = 0

(B) $m = \frac{n\pi}{2} + 1$

(C) $n = \frac{m\pi}{2}$

(D) $m = n = \frac{\pi}{2}$

Q.No. 20 Integrating factor of the differential equation $\cos x \frac{dy}{dx} + y \sin x = 1$ is :

(A) cosx

(B) tanx

(C) secx

(D) sinx

Q.No. 21 Area of the region in the first quadrant enclosed by the x-axis, the line y = x and the circle $x^2 + y^2 = 32$ is

(A) 16π sq units

(B) 4π sq units

(C) 32π sq units

(D) 24 sq units

Q.No. 22 The vector having initial and terminal points as (2, 5, 0) and (−3, 7, 4), respectively is

(A) $-\hat{i} + 12\hat{j} + 4\hat{k}$

(B) $5\hat{i} + 2\hat{j} - 4\hat{k}$

(C) $-5i + 2j + 4k$

(D) $\hat{i} + \hat{j} + \hat{k}$

Q.No. 23 The angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$ is

(A) $\frac{\pi}{3}$

(B) $\frac{2\pi}{3}$

(C) $\frac{-\pi}{3}$

(D) $\frac{5\pi}{6}$

Q.No. 24 A ladder, 5 meter long, standing on a horizontal floor, leans against a vertical wall. If the top of the ladder slides downwards at the rate of 10 cm/sec, then the rate at which the angle between the floor and the ladder is decreasing when lower end of ladder is 2 metres from the wall is:

(A) $\frac{1}{10}$ radian/sec

(B) $\frac{1}{20}$ radian/sec

(C) 20 radian/sec

(D) 10 radian/sec

Q.No. 25 If $\begin{bmatrix} 2x + y & 4x \\ 5x - 7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y - 13 \\ y & x + 6 \end{bmatrix}$, then the value of $xandy$ is

(A) x=3, y=1

(B) x=2, y=3

(C) x=2, y=4

(D) x=3, y=3

Q.No. 26 Feasible region (shaded) for a LPP is shown in the Figure Minimum of Z = 4x + 3y occurs at the point

(A) (0, 8)

(B) (2, 5)

(C) (4, 3)

(D) (9, 0)

Q.No. 27 There are two values of a which makes determinant, $\Delta = \begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix} = 86$, then sum of these number is

(A) 4

(B) 5

(C) -4

(D) 9

Q.No. 28 The distance of the plane $\vec{r} \cdot \left(\frac{2}{7}\hat{i} + \frac{3}{7}\hat{j} - \frac{6}{7}\hat{k} \right) = 1$ from the origin is

(A) 1

(B) 7

(C) $\frac{1}{7}$

(D) None of these

Q.No. 29 The area enclosed by the circle $x^2 + y^2 = 2$ is equal to

(A) 4π sq units

(B) $2\sqrt{2}\pi$ **Sq units**

(C) $4\pi^2$ **sq units**

(D) 2π sq units

Q.No. 30 If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^2 is equal to

(A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 1 \\ 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Q.No. 31 Which of the following is the principal value branch of $\cos^{-1} x$?

(A) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

(B) $(0, \pi)$

(C) $[0, \pi]$

(D) $(0, \pi) - \left\{\frac{\pi}{2}\right\}$

Q.No. 32 The set of points where the function f given by $f(x) = |2x - 1| \sin x$ is differentiable is

(A) R

(B) $\mathbf{R} - \left\{\frac{1}{2}\right\}$

(C) $(0, \infty)$

(D) None of these

Q.No. 33 The coordinates of the foot of the perpendicular drawn from the point (2, 5, 7) on the x-axis are given by

(A) (2, 0, 0)

(B) (0, 5, 0)

(C) (0, 0, 7)

(D) (0, 5, 7)

Q.No. 34 The sine of the angle between the straight line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and the plane $2x - 2y + z = 5$ is

(A) $\frac{10}{6\sqrt{5}}$

(B) $\frac{4}{5\sqrt{2}}$

(C) $\frac{2\sqrt{3}}{5}$

(D) $\frac{\sqrt{2}}{10}$

Q.No. 35 If $3 \tan^{-1} x + \cot^{-1} x = \pi$, then x equals

(A) 0

(B) 1

(C) -1

(D) $\frac{1}{2}$

Q.No. 36 The matrix $P = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a

(A) square matrix

(B) diagonal matrix

(C) unit matrix

(D) None

Q.No. 37 If the directions cosines of a line are k,k,k, then

(A) k>0

(B) 0

(C) k=1

(D) $k = \frac{1}{\sqrt{3}}$ or $-\frac{1}{\sqrt{3}}$

Q.No. 38 Consider the following two binary relations on the set A ={a, b, c} :
R_1={(c, a), (b, b), (a, c), (c, c), (b, c), (a, a)} and
R_2={(a, b), (b, a), (c, c), (c, a), (a, a), (b, b), (a, c)}. Then :

(A) both R_1 and R_2 are not symmetric.

(B) R_1 is not symmetric but it is transitive.

(C) R_2 is symmetric but it is not transitive.

(D) both R_1 and R_2 are transitive.

Q.No. 39 The area of the region bounded by the circle $x^2 + y^2 = 1$ is

(A) 2π sq units

(B) π sq units

(C) 3π sq units

(D) 4π sq units

Q.No. 40 The degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = \frac{d^2y}{dx^2}$ is

(A) 4

(B) $\frac{3}{2}$

(C) Not defined

(D) 2

Answer Sheet

Q.No	Answer
Q.No. 1	(B)
Q.No. 2	(C)
Q.No. 3	(B)
Q.No. 4	(D)
Q.No. 5	(D)
Q.No. 6	(A)
Q.No. 7	(D)
Q.No. 8	(B)
Q.No. 9	(A)
Q.No. 10	(A)
Q.No. 11	(D)
Q.No. 12	(D)
Q.No. 13	(A)
Q.No. 14	(A)
Q.No. 15	(B)
Q.No. 16	(C)
Q.No. 17	(D)
Q.No. 18	(B)
Q.No. 19	(C)
Q.No. 20	(C)
Q.No. 21	(B)
Q.No. 22	(C)
Q.No. 23	(B)
Q.No. 24	(B)
Q.No. 25	(B)
Q.No. 26	(B)
Q.No. 27	(C)
Q.No. 28	(A)
Q.No. 29	(D)
Q.No. 30	(D)
Q.No. 31	(C)
Q.No. 32	(B)
Q.No. 33	(A)
Q.No. 34	(D)

Q.No. 35	(B)
Q.No. 36	(A)
Q.No. 37	(D)
Q.No. 38	(C)
Q.No. 39	(B)
Q.No. 40	(C)