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CBSE SAMPLE PAPER (2024-25)

Time : 03 : 00 Hours | **CLASS – XII MATHS (041)** | **M.M. : 80**

SECTION -A (1 x 20 =20)

1. Set A has 3 elements and the set B has 4 elements. Then the number of injective mappings that can be defined from A to B is :

(a) 144 (b) 12 (c) 24 (d) 64

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

(a) only AB is defined (b) only BA is defined

(c) AB and BA both are defined (d) AB and BA both are not defined

3. If A and B are symmetric matrices of the same order, then $(AB'-BA')$ is a

(a) Skew symmetric matrix (b) Null matrix

(c) Symmetric matrix (d) None of these

4. $\Delta=\begin{vmatrix} 0 & b-a & c-a \\ a-b & 0 & c-b \\ a-c & b-c & 0 \end{vmatrix}$, =

(a) (a-b) (c-a) (b-c) (b) 0 (c) (c-a) (b-c) (d) None of these

5. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix}=\begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x

(a) 3 (b) ± 3 (c) ± 6 (d) 6

6. If A and B are matrices of order 3 and $|A|=5, |B|=3,$ then $|3AB|$ is

(a) 27 (b) 15 (c) 45 (d) 405

7. $\int_0^{\frac{\pi}{2}} \frac{\sin^{2024} x\,dx}{\sin^{2024} x+\cos^{2024} x}=$

(a) $\frac{\pi}{2}$ (b) π (c) $\frac{\pi}{4}$ (d) 2π

8. If $\int \frac{dx}{(x+2)(x^2+1)} = a\log|1+x^2| + b\tan^{-1}x + \frac{1}{5}\log|x+2| + C$, then

(a) $a = \frac{-1}{10}, b = \frac{-2}{5}$ (b) $a = \frac{1}{10}, b = -\frac{2}{5}$ (c) $a = \frac{-1}{10}, b = \frac{2}{5}$ (d) $a = \frac{1}{10}, b = \frac{2}{5}$

9. The degree of the differntial equation

$\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x^2\log\left(\frac{d^2y}{dx^2}\right)$ is

(a) 2 (b) 1 (c) Not defined (d) 3

10. The number of independent arbitrary constants in a differential equation of 3rd order are

(a) 1 (b) 2 (c) 3 (d) None of these

11. If $|\vec{a}| = 8, |\vec{b}| = 3$ and $|\vec{a} \times \vec{b}| = 12$, then the value of $\vec{a}.\vec{b}$ is

(a) $6\sqrt{3}$ (b) $8\sqrt{3}$ (c) $12\sqrt{3}$ (d) None of these

12. Find the vlaue of λ such that vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal

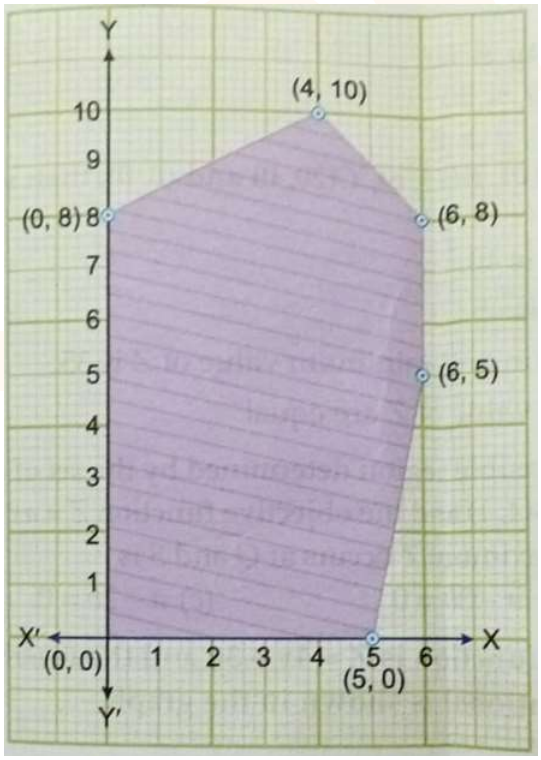
(a) 0 (b) 1 (c) $\frac{3}{2}$ (d) $\frac{-5}{2}$

13. Image of the point (1, 6, 3) in the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$.

(a) (1, 6, 3) (b) (1, 0, 7) (c) (7, 0, 1) (d) None of these

14. The feasible region for an LPP is shown below :-

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)

15. Corner points of the fessible region determined by the system of linear constraints 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 of *Z* occurs at (3, 0) and (1, 1) is :-

(a) $p=2q$ (b) $p=\frac{q}{2}$ (c) $p=3q$ (d) $p=q$

16. If for any two events A and B, $P(A)=\frac{4}{5}$ and $P(A\cap B)=\frac{7}{10}$ then P (B/ A) is equal to :-

(a) $\frac{1}{10}$ (b) $\frac{1}{8}$ (c) $\frac{7}{8}$ (d) $\frac{17}{20}$

17. The vector in the direction of the vector $\hat{i}-2\hat{j}+2\hat{k}$ that has magnitude 9 is

(a) $\hat{i}-2\hat{j}+2\hat{k}$ (b) $\frac{1}{3}\left(\hat{i}-2\hat{j}+2\hat{k}\right)$ (c) $3\left(\hat{i}-2\hat{j}+2\hat{k}\right)$ (d) $9\left(\hat{i}-2\hat{j}+2\hat{k}\right)$

18. 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)

For questions 19 - 20

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true and (R) is false.

(d) (A) is false, but (R) is true.

19. Assertion (A): The domain of the function $\sec^{-1}2x$ is $\left(-\infty,-\frac{1}{2}\right]\cup\left[\frac{1}{2},\infty\right)$

Reason (R): $\sec^{-1}(-2) = -\frac{\pi}{4}$

20. Assertion (A) : If a line makes angles α,β,γ with positive direction of the coordinate axes, then $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=2$

Reason (R) : The sum of squares of the direction cosines of a line is 1.

SECTION - B (2 x 5 =10)

21. Evaluate $\sin\{\text{Cot}^{-1}[\text{Cos}(\tan^{-1}1)]\}$

OR

Evaluate $\tan^{-1}\left\{\frac{-1}{\sqrt{3}}\right\}+\text{Cot}^{-1}\left\{\frac{1}{\sqrt{3}}\right\}+\tan\left(\sin^{-1}\left(\frac{-1}{2}\right)\right)$.

22. Find the value of the constant k so that the function $f(x)=\begin{cases}\frac{\sqrt{1+kx}-\sqrt{1-kx}}{x} & \text{If } -1\le x<0\\ \frac{2x+1}{x-1} & 0\le x<1\end{cases}$ is

continuous at x = 0.

OR

Find a and b If the function given by $f(x)=\begin{cases} ax^2+b & x<1 \\ 2x+1 & x\geq 1 \end{cases}$ is differentiable at x = 1.

23. Find $\int_2^8 \frac{\sqrt{10-x}}{\sqrt{x}+\sqrt{10-x}}dx$.

24. Find λ and μ If $\left(\hat{i}+3\hat{i}+9\hat{k}\right)\times\left(3\hat{i}-\lambda\hat{i}-\mu\hat{k}\right)=\vec{0}$

25. Find a vector $\vec{r}$ of magnitude $3\sqrt{2}$ units which makes and angle of $\frac{\pi}{4}$ and $\frac{\pi}{2}$ with y and z-axis respectively.

SECTION - C(3 x 6=18)

26. Differentiate $\text{Sin}^{-1}\left\{\frac{2^{x+1}}{1+4^x}\right\}$ w.r.t x.

OR

If $y = (\tan^{-1}x)^2$, show that $(x^2+1)y_2 + 2x(x^2+1)y_1 = 2$

27. Find $\int \frac{x^3}{x^4+3x^2+2}dx$

OR

Find $\int \frac{x^2}{(x^2+1)(x^2+4)}dx$

28. Find $\int e^{\tan^{-1}(x)}\left\{\frac{1+x+x^2}{1+x^2}\right\}dx$

29. Minimise z= 13x-15y subject to the constraints :

$x+y\leq 7,\ 2x-3y+6\geq 0,\ x\geq 0, y\geq 0$

30. Two cards are drawn successively without replacement from well shuffled pack of 52 cards. Find the probability distribution of the number of queen.

31. Solve the differential equation

$x^2ydx-(x^3+y^3)\,dy = 0$.

OR

Find the particular solution of $\frac{dy}{dx}+y\sec^2 x = \tan x\sec^2 x$ given that y(0) = 1

SECTION - D (5 x 4 = 20)

32. Show that the relation R defined in set A of all the triangle as R = $\{(T_1,T_2) : T_1 \sim T_2\}$ is an equivalance relation. Consider three right triangles T_1 with sides 3,4,5 and T_2 with side 5, 12,13 and T_3 with sides 6, 8, 10 which triangles among T_1, T_2, T_3 are related to each other ?

OR

Check whether f : $R \to R$ given by $f(x) = x^3$, is one-one or onto or not.

33. Find A^{-1} where $A = \begin{bmatrix} 4 & 2 & 3 \\ 1 & 1 & 1 \\ 3 & 1 & -2 \end{bmatrix}$. Hence solve the following system of equations

$4x+2y+3z = 2$, $x+y+z = 1$

$3x+y-2z = 5$.

34. Find the are a of region included between the parabola $y = \frac{3x^2}{4}$ and the line 3x-2y+12 = 0.

OR

Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $\frac{x}{3} + \frac{y}{2} = 1$

35. A (0, -1, -1), B (4, 5, 1), C (3, 9, 4), D (-4, 4, 4) are the four points then find cartesian equations of lines AB and CD, Hence find the shortest distance between AB, CD.

SECTION- E(4 x 3 = 12)

36. The sum of the surface area of a rectangular parallelopiped with sides x, 2x and $\frac{x}{3}$ and a sphere of radius r is given to be constant. On the basis of this information give the answers of the following questions.

(i) Write relation between x, r and s where s is sum of surface areas of parallelopiped and sphere.

(ii) Write the relation between x, r and v where v is volume of parallelopiped and sphere.

(iii) When volume is minimum find the relation between x and r.

OR

Find the minimum volume of parallelopiped and sphere.

37. $f(x) = x^3 - 6x^2 + 9x + 15$

(i) Find the critical points for the given f(x)

(ii) Find the intervals in which f(x) is increasing or decreasing

(iii) Find the local maximum or minimum value of f(x).

38. The reliability of a LOVID PCR test is speecified as follows :

Of people having COVID, 90% of the test detects the disease but 10% goes undetected of people. free of COVID, 99% of the test is Judged COVID negative but 1% are diagonised as showing COVID Positive.

From a large population of which only 0.1% have COVID, one person is selected at random, given the COVID PCR test, and the pathologist reports him/her as COVID positive.

Answer the following using above information-

1. What is the probability of the person to be tested as positive, given that he is actually having COVID ?
2. What is the probability of the person to be tested as positive, given that he is actually not having COVID?
3. What is the probability that the person is actually not having COVID ?
4. What is the probability that the person is actually having COVID given that he is tested as positive ?

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