



MATHS

BOOKS - ARIHANT PUBLICATION

SAMPLE PAPER 3

Very Short Answer Type Questions

1. Write fog if $f: R \rightarrow R$ and $g: R \rightarrow R$ is given by $f(x) = |x|$ and $g(x) = |5x - 2|$.



Watch Video Solution

2. Find the value of $\left[2 \tan^{-1} \frac{1}{5} - \frac{\pi}{4} \right]$



Watch Video Solution

3. If $A = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}$ find AA^T , where A^T is transpose of matrix A.



Watch Video Solution

4. If A and B, are such that $P(\bar{A} \cup \bar{B}) = \frac{2}{3}$ and $P(A \cup B) = \frac{5}{9}$ then, find the value of $P(\bar{A}) + P(\bar{B})$.



Watch Video Solution

Watch Video Solution

5. Find the approximate change in the volume V of a cube of side x m caused by increasing the side by 2%.



Watch Video Solution

6. IF the derivative of $\tan^{-1}(a + bx)$ w.r.t. x takes the value 1 at $x=0$, write the relationship between a and b .



Watch Video Solution

7. If $\int_0^1 (3x^2 + 2x + k) dx = 0$, then find the value of k .



Watch Video Solution

8. Name of curve which is represented by the solution of

$$\text{differential equation } 2x \frac{dy}{dx} - y = 3$$

 [Watch Video Solution](#)

9. Find the value of λ , such that the line

$$\frac{x - 2}{6} = \frac{y - 1}{\lambda} = \frac{z + 5}{-4} \text{ is perpendicular to the plane}$$

$$3x - y - 2z = 7.$$

 [Watch Video Solution](#)

10. If a and b are unit vectors, then what is the angle between a and b for $\sqrt{3}a - b$ to be a unit vector?

 [Watch Video Solution](#)

Short Answer Type Questions

1. Show that the relation S defined on set $N \times N$ by $(a, b)S(c, d) \Rightarrow a + d = b + c$ is an equivalence relation.

 [Watch Video Solution](#)

2. Answer any one question :

Evaluate $\int_0^3 (2x^3 + 3x + 5) dx$.



Watch Video Solution

3. Let $f: R \rightarrow R$ be a function given by $f(x) = ax + b$ for all $x \in R$. Find the constants a and b such that $\int_{-1}^1 f(x) dx = I_R$.



Watch Video Solution

4. Prove that

$$\tan \left\{ \frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b} \right\} + \tan \left\{ \frac{\pi}{4} - \frac{1}{2} \cos^{-1} \left(\frac{a}{b} \right) \right\} = \frac{2b}{a}$$



Watch Video Solution

5. Answer the question :

Evaluate $\int(2x^3 + 3x^2 + 5) dx$



Watch Video Solution

6. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $KA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$, then find value of a,b and k.



Watch Video Solution

7. Show that

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x - y)(y - z)(z - x)(x + y + z)$$



[Watch Video Solution](#)

8. Find the inverse of the following matrix

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



[Watch Video Solution](#)

9. A card from a pack of 52 playing cards is lost. From the remaining cards of the pack three cards are drawn at

random (without replacement) and are found to be all spades.

 [Watch Video Solution](#)

10. How many times must a man toss a fair coin so that the probability of having at least one head is more than 80%?

 [Watch Video Solution](#)

11. If $f(x+y) = f(x) f(y)$ for all x, y and if $f(5) = 2$ and $f(0) = 3$, then what is the value of $f'(5)$?

 [Watch Video Solution](#)

12. Show that the function $f(x)$ given by

$$f(x) = \begin{cases} x \sin \frac{1}{x}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases} \text{ is continuous at } x=0$$



[Watch Video Solution](#)

13. Show that the line $\frac{x}{a} + \frac{y}{b} = 1$, touches the curve $y = be^{-x/a}$ at point, where curve intersects the axes.



[Watch Video Solution](#)

14. If $f(x) = a \ln x + bx^2 + x$ has extreme values at $x = -1$ and $x = 2$ then find a and b .





Watch Video Solution

15. If $x = 3 \sin t - \sin 3t$, $y = 3 \cos t - \cos 3t$, find $\frac{dy}{dx}$ at $t = \frac{\pi}{3}$.



Watch Video Solution

16.

Evaluate $\int (2x^3 + 3x^2 + 5x + 2) dx$



Watch Video Solution

17. Solve the following differential equation

$$x \frac{dy}{dx} + y = x \cos x + \sin x, \text{ given } y\left(\frac{\pi}{2}\right) = 2$$



Watch Video Solution

18. Evaluate $\int \frac{x^2 + 1}{(x + 1)^2} dx$



Watch Video Solution

19. Evaluate $\int \frac{\cos x \tan x}{(\sec x + \tan x)} dx$



Watch Video Solution

20. Find the area of region included between the parabola $4y = 3x^2$ and the line $3x - 2y + 12 = 0$.



Watch Video Solution

21. Find the direction cosines of the perpendicular from the origin to the plane

$$r(6\hat{i} - 3\hat{j} - 2\hat{k}) + 3 = 0$$

 [Watch Video Solution](#)

22. If \vec{a} and \vec{b} are unit vectors such that $\vec{a} \times \vec{b}$ is a unit vector, then the angle between \vec{a} and \vec{b} is ____

 [Watch Video Solution](#)

23. Using vectors, find the area of the ΔABC , whose vertices are $A(1, 2, 3), B(2, -1, 4)$ and $C(4, 5, -1)$.

 [Watch Video Solution](#)

24. Prove that the lines $x = ay + b, z = cy + d$ and $x = a'y + b', z = c'y + d'$ are perpendicular, if $aa' + cc' + 1 = 0$

 [Watch Video Solution](#)

25. If $a \times b = c \times d$ and $a \times c = b \times d$, show that $(a - d)$ is parallel to $(b - c)$, it being given that $a \neq b$ and $b \neq c$.



Watch Video Solution

Long Answer Type Questions

1. Prove that for any three vectors \vec{a} , \vec{b} and \vec{c} ,
- $$\left[\vec{a} + \vec{b} \vec{b} + \vec{c} \vec{c} + \vec{a} \right] = 2 \left[\vec{a} \vec{b} \vec{c} \right]$$



Watch Video Solution

2. Find the shortest distance between the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \quad \text{and} \quad \frac{x-2}{3} = \frac{y-3}{4} = \frac{z-5}{5}$$



Watch Video Solution

3. Solve: $\sin^{-1}2x + \sin^{-1}x = \frac{\pi}{3}$.

 [Watch Video Solution](#)

4. Consider $f : \mathbb{R} \rightarrow (-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$. Prove that f is invertible with

$$f^{-1}(y) = \left(\frac{\sqrt{54 + 5y} - 3}{5} \right)$$

where \mathbb{R}^+ is the set of all positive real numbers.

 [Watch Video Solution](#)

5. Solve the following LPP graphically

Minimize $Z = 4x + 3y$

subject to $2x + 5y \geq 10$ and $x, y \geq 0$.



[Watch Video Solution](#)

6. Using elementary transformation, find the inverse of the following matrices.

$$\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$$



[Watch Video Solution](#)

7. Solve the following linear algebraic equations using inverse of a matrix.

$$x + y + z = 3, x - 2y + 3z = 2 \text{ and } 2x - y + z = 2$$



[Watch Video Solution](#)

 [Watch Video Solution](#)

8. An urn contains 4 white and 3 red balls. Let X be the number of red balls in a random draw of 3 balls. Find the mean and variance of X .

 [Watch Video Solution](#)

9. Show that the rectangle of maximum perimeter which can be inscribed in a circle of radius a is a square of side $\sqrt{2}a$.

 [Watch Video Solution](#)

10. If $y = \left(x + \sqrt{1 + x^2}\right)^n$, then show that

$$(1 + x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = n^2y.$$

 [Watch Video Solution](#)

11. Solve the differential equation $\frac{dy}{dx} = \frac{y - x + 1}{y + x + 5}$.

 [Watch Video Solution](#)

12. Evaluate $\int \frac{dx}{2 \sin x + \cos x + 3}$

 [Watch Video Solution](#)

13. Find the area between the curve $y = 4 + 3x - x^2$ and X-axis.



[Watch Video Solution](#)