



MATHS

BOOKS - ARIHANT PUBLICATION

SAMPLE PAPER 1

Very Short Answer Type Question

1. Find the inverse of the function $f(x) = (x - 3)^3$



Watch Video Solution

2. Find the domain of the function defined by

$$f(x) = \sin^{-1} \sqrt{x-1}.$$

 [Watch Video Solution](#)

3. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find the value of $A^2 - 3A + 2I$

 [Watch Video Solution](#)

4. Two dice are thrown. Find the probability of getting an odd number on the first and a multiple of

3 on the other



[Watch Video Solution](#)

5. If $f(x) = |\cos x|$, then find $f' \left(\frac{3\pi}{4} \right)$



[Watch Video Solution](#)

6. Find an angle θ where $0 < \theta < \frac{\pi}{2}$ which increase twice as fast as its sine



[Watch Video Solution](#)

7. Evaluate $\int \frac{\sin 2x (dx)}{a^2 \sin^2 x + b^2 \cos^2 x}$



[Watch Video Solution](#)

8. Solve each of the following differential equations :

$$x \cos y dy = (x e^x \log x + e^x) dx.$$



[Watch Video Solution](#)

9. If $|a| = 3$ and $-4 \leq k \leq 1$ then find range of value of $|ka|$



[Watch Video Solution](#)

10. Find a normal vector to the plane

$$x + 2y + 3z - 5 = 0$$



Watch Video Solution

Short Answer Type Questions

1. If the inverse equation is $\sin^{-1} x = 2 \sin^{-1} a$ then

prove that $|a| \leq \frac{1}{\sqrt{2}}$



Watch Video Solution

2. Maximize $Z = -x + 2y$ subject to constraints
are $x \leq 3x + y \geq 5x + 2y \geq 6$ and $x, y \geq 0$



[Watch Video Solution](#)

3. Let $f: \mathbb{N} \rightarrow \mathbb{N}$ be defined by

$$f(n) = \begin{cases} \frac{n+1}{2} & \text{if } n \text{ is odd} \\ \frac{n}{2} & \text{if } n \text{ is even} \end{cases}$$

Show that f is many one and onto function.



[Watch Video Solution](#)

4. If the function $f : \mathbb{R} \rightarrow \mathbb{R}$ is given by $f(x) = x^2 + 2$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ is given by $g(x) = \frac{x}{x-1}$, $x \neq 1$ then find $f \circ g$ and $g \circ f$ and hence find $f \circ g(2)$ and $g \circ f(-3)$.



[Watch Video Solution](#)

5. If $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$, then find x .



[Watch Video Solution](#)

6. If $P(A) = 0.4$, $P(B/A) = 0.3$ and $P\left(\frac{B^c}{A^c}\right) = 0.2$. Find $P(B)$.



[Watch Video Solution](#)

 [Watch Video Solution](#)

7. A bag consists of 10 balls each marked with one of the digits 0 to 9 if four balls are drawn successively with replacement from the bag what is probability that none is marked with the digit 0

 [Watch Video Solution](#)

8. Using the properties of determinants? show that

$$\begin{vmatrix} y + z & x & y \\ z + x & z & x \\ x + y & y & z \end{vmatrix} = (x + y + z)(x - z)^2$$

 [Watch Video Solution](#)

9. Using elementary transformations, find the inverse

of

$$\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$$



Watch Video Solution

10. Find the matrix A such that

$$A \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}.$$



Watch Video Solution

11. If $y = \log \left[x + \sqrt{x^2 + 1} \right]$, then prove that

$$(x^2 + 1) \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 0.$$



Watch Video Solution

12. Prove that the function f given by

$f(x) = |x - 1|$, $x \in R$ is not differentiable at $x = 1$.



Watch Video Solution

13. Using differentials, find approximate value

$$(255)^{1/4}$$



Watch Video Solution

 Watch Video Solution

14. The two equal sides of an isosceles triangle with fixed base b are decreasing at the rate 3 cm/s. How fast is the area decreasing, where the equal sides are equal to the base.

 Watch Video Solution

15. If $x^y = e^{x-y}$ then prove that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$.

 Watch Video Solution

16. Evaluate $\int(\sqrt{\tan x} + \sqrt{\cot x}) dx$



[Watch Video Solution](#)

17. Form the differential equation of the family of circles touching the X-axis at origin.



[Watch Video Solution](#)

18. Solve each of the following differential equations :

$$x \frac{dy}{dx} - y = \sqrt{x^2 + y^2}.$$



[Watch Video Solution](#)

19. Using properties of definite integrals, evaluate

$$\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\tan x}}$$



Watch Video Solution

20. Find the area of the region

$$\{(x, y) : 0 \leq y \leq x^2 + 1, 0 \leq y \leq x + 1, 0 \leq x \leq 2\}$$



Watch Video Solution

21. Find the value of x such that the four points $A(3, 2, 1)$, $B(4, x, 5)$, $C(4, 2, -2)$ and $D(6, 5, -1)$ are coplanar.



 Watch Video Solution

22. Find the equation of the plane which contains the line of intersection of the planes

$$\vec{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) - 4 = 0, \vec{r} \cdot (2\hat{i} + \hat{j} - \hat{k}) + 5 = 0$$

and which is perpendicular to the plane

$$\vec{r} \cdot (5\hat{i} - 6\hat{k}) + 8 = 0$$



Watch Video Solution

23. Find a unit vector in XY-plane, which makes an angle of 45° with the vector $\hat{i} + \hat{j}$ and an angle of 60° with the vector $3\hat{i} - 4\hat{j}$



Watch Video Solution

 Watch Video Solution

24. If a , b and c are vectors such that $a \cdot b = a \cdot c$, $a \times b = a \times c$, $a \neq 0$, then show that $b=c$

 Watch Video Solution

25. Let $v=2\hat{i} + \hat{j} - \hat{k}$ and $w = \hat{i} + 3\hat{k}$ if u is unit vector then find the maximum value of the scalar triple product u, v and w

 Watch Video Solution

Long Answer Type Questions

1. Find the distance of the point $(-2, 3, -4)$ from the line

$$\frac{x + 2}{3} = \frac{2y + 3}{4} = \frac{3z + 4}{5} \text{ measured parallel to}$$

the plane $4x + 12y - 3z + 1 = 0$



[Watch Video Solution](#)

2. If \vec{a} , \vec{b} and \vec{c} are three vectors such that $\vec{a} \times$

$\vec{b} = \vec{c}$ and $\vec{b} \times \vec{c} = \vec{a}$, then prove that

\vec{a} , \vec{b} and \vec{c} are mutually at right angles and

$$|\vec{b}| = 1, |\vec{c}| = |\vec{a}|$$



[Watch Video Solution](#)

3. Show that the relation R on the set $A=\{1, 2, 3, 4, 5\}$ given by $R=\{(a,b):|a - b| \text{ is even}\}$ is an equivalence relation.

 [Watch Video Solution](#)

4. Solve for x ,

$$\tan^{-1}(x + 1) + \tan^{-1}(x - 1) = \tan^{-1} \frac{8}{31} \quad [0 < x < 1]$$

.

 [Watch Video Solution](#)

5. David wants to invest atmost Rs 12000 in bonds A and B. According to the rule, he has to invest atleast Rs 2000 in bond A and atleast Rs 4000 in bond B. If the rates of interest on bond A and B respectively, are 8% and 10% per annum. Formulate the problem as linear programming problem and solve it graphically for maximum interest. Also, determine the maximum interest received in a year.



[Watch Video Solution](#)

6. If $A = \begin{bmatrix} 0 & -\tan\left(\frac{\alpha}{2}\right) \\ \tan\left(\frac{\alpha}{2}\right) & 0 \end{bmatrix}$ show that

$$(I + A) = (I - A) \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix} \quad \text{where}$$

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$



Watch Video Solution

7. Use matrix product

$$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix} \text{ to solve the system}$$

of equation

$$x - y + 2z = 1$$

$$2y - 3z = 1 \text{ and } 3x - 2y + 4z = 2$$





[Watch Video Solution](#)

8. A and B throw a die for a prize of Rs 11 which is to be won by the player who first throws six. If A throws first, what are their respective expectations?



[Watch Video Solution](#)

9. An apache helicopter of enemy is flying along the curve given by $x^2 + 7$ A soldier placed at (3,7) wants to shoot down the helicopter when it is nearest to him find the nearest distance between the soldier and helicopter



[Watch Video Solution](#)

10. Find $\frac{dy}{dx}$ if $y = \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

$$0 < x < 1$$

[Watch Video Solution](#)

11. Draw a rough sketch of $y^2 = x + 1$ and $y^2 = -x + 1$ and determine the area enclosed by the two curves

[Watch Video Solution](#)

12. Evaluate $\int \frac{(x^2 + 1)(x^2 + 2)}{(x^2 + 3)(x^2 + 4)} dx$



[Watch Video Solution](#)

13. solve the given differential equation $x^2 \frac{dy}{dx} = y^2$

given that $y = 1$ when $x = 1$



[Watch Video Solution](#)