CLASS XII
SAMPLE PAPER
MATHS

SECTION A

1. If f: R $\rightarrow R$ be given by f (x) = $(3- x^3)^{\frac{1}{3}}$ then find $fof(x)$

2. Find the value of Sin^{-1} ($\sin\left(\frac{3\pi}{5}\right)$)

3. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and A + A^T = I. Find the value of α

4. Find the value of 'x' if $\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix}\begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = 0$

5. Find the constant 'c' if A = $\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & c \end{bmatrix}$ *is a singular matrix*

6. Evaluate $\int \frac{\sin^8 x - \cos^8 x}{1-2\sin^2 x.\cos^2 x}$

7. Evaluate $\int \frac{(x^4 - x)^{\frac{1}{4}} dx}{x^5}$

8. Find $\left|\vec{a} - \vec{b}\right|$ *if two vectors* $\vec{a}$ *and* $\vec{b}$ *are such that* $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3$ *and* $\vec{a} . \vec{b} = 4$

9. Find the value of $i.(j\times k)+ j.(i\times k) + k.(i\times j)$

10. Find a unit vector perpendicular to each of the vectors $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ where

$\vec{a} = i+j+k$ and $\vec{b} = i+2j+3k$

11. Check whether the operator $\oplus$ defined by $a\oplus b = a+b-ab$ is commutative and associative

12. Prove that $Cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)=\frac{x}{2}$

OR

Prove that $\frac{9\pi}{8}-\frac{9}{4}Sin^{-1}\frac{1}{3}=\frac{9}{4}Sin^{-1}\frac{2\sqrt{2}}{3}$

13. Prove that $\begin{vmatrix} 3a & -a+b & -a+c \\ a-b & 3b & c-b \\ a-c & b-c & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$

14. Find the value of k so that the function defind by

$$f(x)=\begin{cases}\frac{1-\cos 4x}{8x^2} & if\ \ x\neq 0 \\ k & if\ \ x=0\end{cases} \text{ is continous at } x=0$$

15. $y=\tan^{-1}\left[\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right]$ find $\frac{dy}{dx}$

16. If $x^y=e^{x-y}$, show that $\frac{dy}{dx}=\frac{\log x}{(1+\log x)^2}$

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

OR

$Evaluate \int \frac{Sin x\, dx}{Sin(x-a)}$

18. *Find a particular solution for the equation* $x(1+y^2)dx - y(1+x^2)dy = 0$ *given that* $y = 0$ *when* $x = 1$

OR

$Solve\ x^2 \frac{dy}{dx} = y(x+y)\ dx$

19. *Solve the differntid equation* $x\frac{dy}{dx} + y = x\cos x + \sin x$ *Given that* $y\left(\frac{\pi}{2}\right) = 1$

20. *Dot product of a vector with the vectors* $i + j - 3k, i + 3j - 2k$ *and* $2i + j + 4k$ *are* 0,5 *and* 8 *respectivdy. Find the vector*

21. *Find the shortest distance between the lines*

$\vec{r} = (1+2\lambda)\, i + (2+3\lambda)\, j + (3+4\lambda)k$ *and*

$\vec{r} = (2+3\mu)\, i + 4(1+\mu)\, j + 5(1+\mu)k$

OR

Find the equation of the line passing through the point (2,1,3) *and perpendicular to the lines* $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$ *and* $\frac{x}{-3} = \frac{y}{2} = \frac{z}{5}$

22. The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs

(i) None (ii) at least one Will fuse after 150 days

SECTION B

23. Using elementary transformation find the inverse of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

24. Show that all the rectangles inscribed in given circle square has the maximum area

OR

A water tank has the shape of an inverted right circular cone with its axis vertical and vertex lowermost .Its semi vertical angle is tan-1 (0.5) .Water is poured in to it at a constant rate of 5 cubic meter per hour .Find the rate at which the level of the water is rising at the instant when the depth of the water tank is 4m.

25. Prove that $\int_0^{\frac{\pi}{2}} \log(\sin x)dx = \int_0^{\frac{\pi}{2}} \log(\cos x)dx = \frac{-\pi}{2}\log 2$

OR

Evaluate limit as a sum $\int_1^4 (x^2 - x)\,dx$

26. Find the area of the region bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4by$

27. A doctor is to visit a patient .From the past experiences , it is known that the probabilities that he will come by train , bus , scooter or by other means of transport are respectively $\frac{3}{10}, \frac{1}{5}, \frac{1}{10}\ and \frac{2}{5}$. The probabilities that he will be late are $\frac{1}{4}, \frac{1}{3}\ and \frac{1}{12}$, if he comes by

train , bus, and scooter respectively , but if he come by other means of transport , then he will not be late .When he arrives he is late .What is the probability that he comes by train ?

28. A line makes angles $\alpha, \beta, \gamma \text{ and } \delta$ with the diagonals of a cube , prove that

$$\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta = \frac{4}{3}$$

29. A manufacturing company produces two models A and B of a product .Each piece of model A requires 9 labour hours for fabricating and 1 hour for finishing .Each piece of model B requires 12 labour hours for fabricating and 3 hour for finishing. For fabricating and finishing the maximum labour hours available are 180 and 30 respectively .The company makes a profit of Rs.8000 on each piece of model A and Rs.12000 on each piece of model B .How many pieces of model A and model B should manufactured per week to get a maximum profit ? What is the maximum profit (Solve as a linear programming problem)

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