

# Sample Paper – 2010

## Class – XII

### Subject – Maths

1. If  $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ , then show that A is a root of the polynomial  $f(x) = x^3 - 6x^2 + 7x + 21$ .

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2. Find the value of  $\tan \frac{1}{2} \left[ \sin^{-1} \frac{2x}{1+x^2} + \cos^{-1} \frac{1-y^2}{1+y^2} \right]$ ,  $|x| < 1, y > 0$  and  $xy < 1$ .

3. Using properties of determinants, Show that  $\begin{vmatrix} 1 & a & a^2 & -bc \\ 1 & b & b^2 & -ca \\ 1 & c & c^2 & -ab \end{vmatrix} = 0$ .

4. Solve the equations  $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$ .

5. If  $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ , find  $A^{-1}$  and hence solve the system of linear equations

$$x + 2y + z = 4, -x + y + z = 0, x - 3y + z = 2$$

6. Find the value of a and b such that the function defined by

$$f(x) = \begin{cases} 5, & \text{if } x \leq 2 \\ ax + b, & \text{if } 2 < x < 10 \\ 21, & \text{if } x \geq 10 \end{cases}$$

is a continuous function.

7. If  $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ , find  $A^{-1}$  using elementary row transformations.

8. Find  $\frac{dy}{dx}$ , if  $y = e^{x \log a} + e^{a \log x} + e^{a \log a}$ .
9. If  $y = e^x \cdot \cos x$ , prove that  $\frac{dy}{dx} = \sqrt{2} e^x \cdot \cos\left(x + \frac{\pi}{4}\right)$ .
10. If  $f(x) = \begin{bmatrix} x + a^2 & ab & ac \\ ab & x + b^2 & bc \\ ac & bc & x + c^2 \end{bmatrix}$ , Find  $f'(x)$ .
11. If  $y = \{\log_{\cos x} \sin x\} \{\log_{\sin x} \cos x\}^{-1} + \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ , find  $\frac{dy}{dx}$  at  $x = \frac{\pi}{4}$ .
12. Using mathematical induction prove that  $\frac{d}{dx}(x^n) = n x^{n-1}$  for all positive integer n.
13. Differentiate  $\tan^{-1}\left\{\frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}}\right\}$  with respect to  $\cos^{-1} x^2$ .
14. If  $x = e^{\cos 2t}$  and  $y = e^{\sin 2t}$ , show that  $\frac{dy}{dx} = -\frac{y \log x}{x \log y}$ .
15. Differentiate the function  $(x \cos x)^x + (x \sin x)^{\frac{1}{x}}$ .