

DELHI PUBLIC SCHOOL, JAMMU
ASSIGNMENT NO. 1

(MATHEMATICS)
CLASS – 12TH

Section A (1 Mark each)

- Find the number of all onto functions from the set $\{1,2,3,\dots,n\}$ to itself.
- Find the value of $\sin \sin \left[\frac{\pi}{3} - \sin^{-1} \frac{-1}{2} \right]$
- If A is a square matrix of order 3 such that $|A| = \delta$, then write the value of $|-A|$
- Find the value of x from the following: $\begin{bmatrix} 2x-3 & 5 \\ 3 & y \end{bmatrix} = \begin{bmatrix} 6 & 5 \\ 3 & -2 \end{bmatrix}$

SECTION B (2 Marks each)

- Show that the relation R on the set $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$ is given by $R = \{(a,b) : |a-b| \text{ is a multiple of } 4\}$ is an equivalence relation.
- Solve $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$
- Show that $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ satisfies the equation $x^2 - 6x + 17 = 0$
- Find $A + A^T$, if $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$

SECTION C (4 MARKS EACH)

- Let $f: \mathbb{N} \rightarrow \mathbb{N}$ defined by $f(x) = \begin{cases} \frac{n+1}{2}, & \text{if } n \text{ is odd } \forall n \in \mathbb{N} \\ \frac{n}{2}, & \text{if } n \text{ is even} \end{cases}$. find whether the function f is bijective .
- Prove that $\cot^{-1} \left[\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} \right] = \frac{\pi}{2}, x \in \left(0, \frac{\pi}{4} \right)$

- Using elementary transformation, find the inverse of a matrix $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

- Prove that: $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$

- If the operation * on $\mathbb{Q} - \{1\}$ defined by $a * b = a + b - ab$ for all $a, b \in \mathbb{Q} - \{1\}$, then i) Is * is commutative ii) Is * is associative iii) find identity element iv) find the inverse of a for each $a \in \mathbb{Q} - \{1\}$

SECTION C (6 MARKS EACH)

- Consider $f: \mathbb{R} \rightarrow [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible and $f^{-1}(y) = \left(\frac{\sqrt{y+6}-1}{3} \right)$
- If $\sin^{-1} x + \sin^{-1} y + \sin^{-1} z = \pi$, Prove that $x\sqrt{1-x^2} + y\sqrt{1-y^2} + z\sqrt{1-z^2} = 2xyz$
- Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations $x - y + 2z = 1$, $2y - 3z = 1$, $3x - 2y + 4z = 2$