

**SAINIK SCHOOL AMARAVATHINAGAR**

**CLASS XII – SUMMER VACATION HOME WORK**

**ANNEXURE A**

1. If  $3A - B = \begin{pmatrix} 5 & 0 \\ 1 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 4 & 3 \\ 2 & 5 \end{pmatrix}$ , then find matrix A.
2. For what value of x the matrix  $\begin{pmatrix} 1+x & 7 \\ 3-x & 8 \end{pmatrix}$  is a singular matrix.
3. For what value of x, is the matrix  $A = \begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{pmatrix}$ , a skew-symmetric matrix.
4. If  $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}$  write the value of x.
5. Determine the product:  
 $\begin{pmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{pmatrix} \begin{pmatrix} 1 & -1 & 2 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{pmatrix}$  and use it to solve the system of equations  
 $x - y + z = 4$ ,  $x - 2y - 2z = 9$ ,  $2x + y + 3z = 1$ .
6. Using elementary operation, find the inverse of  $\begin{pmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$
7. Using elementary operation, find the inverse of  $\begin{pmatrix} 1 & 3 & -2 \\ -3 & 0 & -1 \\ 2 & 1 & 0 \end{pmatrix}$
8. Using elementary operation, find the inverse of  $\begin{pmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{pmatrix}$
9. Using elementary operation, find the inverse of  $\begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$
10. A matrix A of order  $3 \times 3$  is such that  $|A| = 4$ . Find the values of  $|2A|$ .
11. Prove that  $\begin{vmatrix} \sqrt{6} & \sqrt{5} \\ \sqrt{20} & \sqrt{24} \end{vmatrix} = 2$ .
12. Write the value of  $\begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 6x & 9x & 12x \end{vmatrix} = 0$ .

## ANNEXURE B

I. Using the property of determinants, prove that

$$1. \begin{bmatrix} \alpha & \beta & \gamma \\ \alpha^2 & \beta^2 & \gamma^2 \\ (\beta + \gamma) & \gamma + \alpha & \alpha + \beta \end{bmatrix} = (\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)(\alpha + \beta + \gamma)$$

$$2. \begin{bmatrix} a + b + 2c & a & a \\ c & b + c + 2a & b \\ c & a & c + a + 2b \end{bmatrix} = 2(a + b + c)^2$$

$$3. \begin{bmatrix} x & x + y & x + 2y \\ x + 2y & x & x + y \\ x + y & x + 2y & x \end{bmatrix} = 9y^2(x + y)$$

$$4. \begin{bmatrix} a^2 & a^2 - (b - c)^2 & bc \\ b^2 & b^2 - (c - a)^2 & ca \\ c^2 & c^2 - (a - b)^2 & ab \end{bmatrix} = (a - b)(b - c)(c - a)(a + b + c)(a^2 + b^2 + c^2)$$

$$5. \begin{bmatrix} a + x & a - x & a - x \\ a - x & a + x & a - x \\ a - x & a - x & a + x \end{bmatrix} = 0$$

$$6. \begin{bmatrix} b + c & c + a & a + b \\ q + r & r + p & p + q \\ y + z & z + x & x + y \end{bmatrix} = 2 \begin{bmatrix} a & b & c \\ p & q & r \\ x & y & z \end{bmatrix}$$

7. If  $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$ . Find  $A^{-1}$  and hence solve  $2x - 3y + 5z = 11$ ,  $3x + 2y - 4z = -5$ ,  $x + y - 2z = -3$ .

8. If  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ , show that  $A^3 - 6A^2 + 5A + 11I = 0$ , find  $A^{-1}$ .

9.  $A = \begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$  Express A as sum of two matrices s t one is symmetric and the other is skew symmetric.

### ANNEXURE C

1. Show that the function  $F$  in  $A = \mathbb{R} - \left\{\frac{2}{3}\right\}$  defined as  $f(x) = \frac{4x+3}{6x-4}$  is one one and onto hence find  $f^{-1}$ .
2. Let  $A = \mathbb{R} - \{3\}$  and  $B = \mathbb{R} - \{1\}$ , consider the function  $F:A \rightarrow B$  defined by  $f(x) = \frac{x-2}{x-3}$ . Show that  $F$  is one-one and onto and hence find  $F^{-1}$ .
3. If the function  $f:\mathbb{R} \rightarrow \mathbb{R}$  is given by  $f(x) = \frac{x+3}{2}$  and  $g:\mathbb{R} \rightarrow \mathbb{R}$  is given by  $g(x) = 2x-3$ , find
  - (a)  $f \circ g$
  - (b)  $g \circ f$
  - (c) Is  $f^{-1} = g$

### ANNEXURE D

1. Write the value of  $\tan^{-1} \left[ 2 \sin \left( 2 \cos^{-1} \frac{\sqrt{3}}{2} \right) \right]$ .
2. If  $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$  where  $xy < 1$ , find the value of  $x+y = xy$ .
3. Find the Principal value of  $\tan^{-1} \sqrt{3} - \sec^{-1} (-2)$ .
4. Write the value of  $\sin \left[ \frac{\pi}{3} - \sin^{-1} \left( -\frac{1}{2} \right) \right]$ .
5. Find  $x$  if  $\tan^{-1} 4 + \cot^{-1} x = \frac{\pi}{2}$ .
6. What is the principal value of  $\cos^{-1} \left( \cos \frac{2\pi}{3} \right) + \sin^{-1} \left( \sin \frac{2\pi}{3} \right)$ .
7. What is the principal value of  $\sin^{-1} \left( \sin \frac{3\pi}{5} \right)$ .
8. Find the value of  $\tan \frac{1}{2} \left[ \sin^{-1} \frac{2x}{1+x^2} + \cos^{-1} \frac{1-y^2}{1+y^2} \right]$
9. P.T  $\tan^{-1} \left( \frac{1}{2} \right) + \tan^{-1} \left( \frac{1}{5} \right) + \tan^{-1} \left( \frac{1}{8} \right) = \frac{\pi}{4}$ .

10. P. T  $\tan\left(\frac{1}{2} \sin^{-1} \frac{3}{4}\right) = \frac{4-\sqrt{7}}{3}$ .
11. Solve  $\cos(\tan^{-1} x) + \sin(\cot^{-1} \frac{3}{4})$ .
12. Solve  $\tan^{-1} \frac{x-1}{x-2} + \tan^{-1} \frac{x+1}{x+2} = \frac{\pi}{4}$ .
13. Solve for x,  $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$ .
14. Prove that  $\tan^{-1}\left(\frac{\cos x}{1+\sin x}\right) = \frac{\pi}{4} - \frac{x}{2}$ .
15. Prove that  $\sin^{-1}\left(\frac{8}{17}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \cos^{-1}\left(\frac{36}{85}\right)$ .
16. Prove that  $\cos\left(\sin^{-1} \frac{3}{5} + \cot^{-1} \frac{3}{2}\right) = \frac{6}{5\sqrt{13}}$ .
17. Prove that  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{14}\right) = \cos^{-1}\left(\frac{33}{65}\right)$ .
18. Prove that  $\sin[\cos^{-1}\{\cos(\tan^{-1} x)\}] = \sqrt{\frac{x^2+1}{x^2+2}}$ .
19. Solve for x,  $3 \sin^{-1}\left(\frac{2x}{1+x^2}\right) - 4 \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + 2 \tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{\pi}{3}$ .
20. Prove that  $2 \tan^{-1}\left(\frac{3}{4}\right) - \tan^{-1}\left(\frac{17}{31}\right) = \frac{\pi}{4}$ .
21. Solve for x,  $\tan^{-1}\left(\frac{2x}{1-x^2}\right) + \cot^{-1}\left(\frac{1-x^2}{2x}\right) = \frac{\pi}{3}$ .
22. Find the value of  $\tan^{-1}\left(\frac{x}{y}\right) - \tan^{-1}\left(\frac{x-y}{x+y}\right)$ .
23. Solve  $\tan^{-1}(x+2) + \tan^{-1}(x-2) = \tan^{-1}\left(\frac{\theta}{79}\right)$ .
24. Prove that  $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{8}{17} = \cos^{-1} \frac{36}{85}$ .
25. Solve for x,  $2 \tan^{-1}(\sin x) = \tan^{-1}(2 \sec x)$ .
26. Prove that  $\tan \frac{1}{2} \left[ \sin^{-1} \frac{2x}{1+x^2} + \cos^{-1} \frac{1-y^2}{1+y^2} \right] = \frac{x+y}{1-xy}$ .

27. Prove that  $\tan^{-1} \sqrt{x} = \frac{1}{2} \cos^{-1} \left( \frac{1-x}{1+x} \right)$
28. Solve for x,  $\tan^{-1} \left( \frac{x+1}{x-1} \right) + \tan^{-1} \left( \frac{x-1}{x} \right) = \tan^{-1} (-7)$ .
29. Solve for x,  $\tan^{-1} \left( \frac{2x}{1-x^2} \right) + \cot^{-1} \left( \frac{1-x^2}{2x} \right) = \frac{2\pi}{3}$ .

### **ANNEXURE E**

1. From class XII NCERT text book Pg. No 29, Problem No 1 to 19.
2. From class XII NCERT text book Pg. No 100, Problem No 1 to 15.
3. From class XII NCERT text book Pg. No 141, Problem No 1 to 9.

**Note:** Cadets should write the vacation homework in the separate unruled notebook.

