

Now, for $A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$ and $x \in X_2$

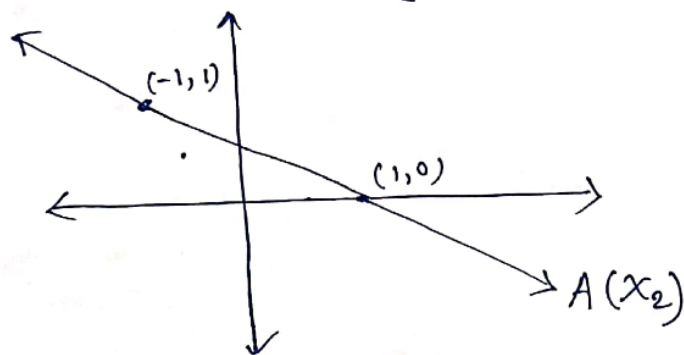
Page-3

$$\begin{aligned} X_2 &= \{x \mid x_1 - x_2 = 1, x \in \mathbb{R}^2\} \\ &= \{x = (x_1, x_1 - 1) : x_1 \in \mathbb{R}\} \end{aligned}$$

$$\therefore A(X_2) = \left[\begin{array}{c|c} 1 & 1 \\ 0 & -1 \end{array} \right]$$

$$\therefore Ax = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_1 - 1 \end{bmatrix} = \begin{bmatrix} x_1 + x_1 - 1 \\ 1 - x_1 \end{bmatrix} = \begin{bmatrix} 2x_1 - 1 \\ 1 - x_1 \end{bmatrix}$$

$$\begin{aligned} \Rightarrow A(X_2) &= \{(2x_1 - 1, 1 - x_1) : x_1 \in \mathbb{R}\}, x \in X_2 \\ &= \{(2t - 1, 1 - t) : t \in \mathbb{R}\} \end{aligned}$$



Now, for $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$ and $x \in X_1$

$$\begin{aligned} X_1 &= \{x \mid x_1 + x_2 = 1, x \in \mathbb{R}^2\} \\ &= \{x = (x_1, 1 - x_1) : x_1 \in \mathbb{R}\} \end{aligned}$$

$$\therefore Ax = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ 1 - x_1 \end{bmatrix} = \begin{bmatrix} x_1 - (1 - x_1) \\ x_1 + (1 - x_1) \end{bmatrix} = \begin{bmatrix} 2x_1 - 1 \\ 1 \end{bmatrix}$$

, for all $x \in X_1$

$$\begin{aligned} \Rightarrow A(X_1) &= \{(2x_1 - 1, 1) : x_1 \in \mathbb{R}\} \\ &= \{(2t - 1, 1) : t \in \mathbb{R}\} \end{aligned}$$