Q Find the Eigen value and Eigen Vector for matrix $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$

Solution

The characteristics equation for matrix A

$$|A - \lambda I| = 0$$

$$\begin{vmatrix} 1-\lambda & -2 \\ -5 & 4-\lambda \end{vmatrix} = 0$$

$$(1-\lambda)(4-\lambda) - (-2)(-5) = 0$$

$$4 - \lambda - 4\lambda + \lambda^2 - 10 = 0$$

$$\lambda^2 - 5\lambda - 6 = 0$$

$$\lambda^2 - 6\lambda + \lambda - 6 = 0$$

$$\lambda(\lambda - 6) + (\lambda - 6) = 0$$

$$(\lambda - 6)(\lambda + 1) = 0$$

$$\boxed{\lambda = 6} \quad \boxed{\lambda = -1}$$

$\lambda = 6, -1$ Eigen value of A.

Eigen Vector:

Case 01: let $X_1 = \begin{bmatrix} x \\ y \end{bmatrix}$ be the Eigen Vector of A Corresponding to $\lambda = 6$.

Then $(A - \lambda I) = 0$

$$\begin{bmatrix} 1-6 & -2 \\ -5 & 4-6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 0$$