12.442

EE25BTECH11012-BEERAM MADHURI

Question:

Eigen values of the matrix $\begin{pmatrix} 5 & 3 \\ 1 & 4 \end{pmatrix}$ are

a) -6.3 and -2.7 b) -2.3 and -6.7 c) 6.3 and 2.7 d) 2.3 and 6.7

Solution:

Let

$$A = \begin{bmatrix} 5 & 3 \\ 1 & 4 \end{bmatrix} \tag{0.1}$$

$$A = \lambda I \tag{0.2}$$

where 'λ' are eigen values.

$$\left|A - \lambda I\right| = 0 \tag{0.3}$$

$$\left\|\begin{bmatrix} 5 & 3 \\ 1 & 4 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\right\| = 0 \tag{0.4}$$

$$\left\|\begin{bmatrix} 5-\lambda & 3 \\ 1 & 4-\lambda \end{bmatrix}\right\| = 0 \tag{0.5}$$

$$(5-\lambda)(4-\lambda) - 3 = 0 \tag{0.6}$$

$$20 - 9\lambda + \lambda^2 - 3 = 0 \tag{0.7}$$

$$\lambda^2 - 9\lambda + 17 = 0 \tag{0.8}$$

$$\lambda_1 = 6.3 \tag{0.9}$$

$$\lambda_2 = 2.7 \tag{0.10}$$

Hence eigen values of given matrix are 2.7 and 6.3.

$\therefore$ Option C is correct.

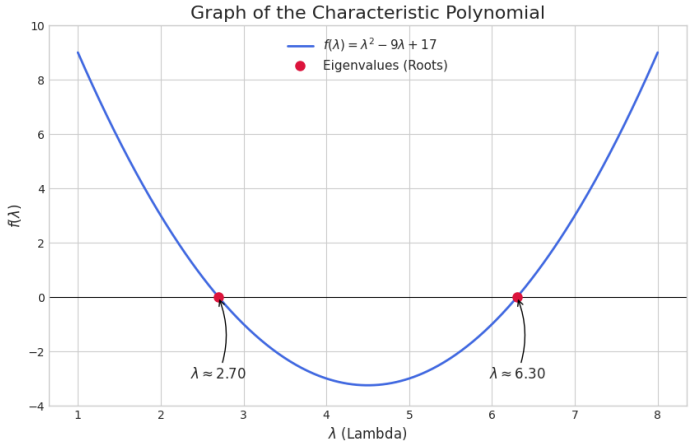
Graph of the Characteristic Polynomial
$f(\lambda) = \lambda^2 - 9\lambda + 17$
Eigenvalues (Roots)
$f(\lambda)$
λ (Lambda)
$\lambda \approx 2.70$
$\lambda \approx 6.30$
10
8
6
4
2
0
−2
−4
1
2
3
4
5
6
7
8

Fig. 0.1: 12.442