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Computer Science

MAT 205

Question 1

~~Find the eigen values and vectors~~

Define the following

Null matrix :- This is a matrix all of whose entries are zero.

Identity Matrix :- is a square matrix in which all the elements of the principal diagonal are ones and all other elements are zero

Equal Matrix :- is when two matrices have the same dimension or order and the corresponding elements are identical

Question 2

Find the eigen values and vectors for

$$\begin{bmatrix} 5 & -6 & 1 \\ 1 & 1 & 0 \\ 3 & 0 & 1 \end{bmatrix}$$

$$\lambda = 4$$

$$\begin{bmatrix} 5-\lambda & -6 & 1 \\ 1 & 1-\lambda & 0 \\ 3 & 0 & 1-\lambda \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -6 & 1 \\ 1 & -3 & 0 \\ 3 & 0 & -3 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$x_1 - 6x_2 + x_3 = 0 \quad \text{--- i}$$

$$x_1 - 3x_2 + 0 = 0 \quad \text{--- ii}$$

$$3x_1 + 0 + 3x_3 = 0 \quad \text{--- iii}$$

from (ii)

$$\frac{x_1}{x_2} = \frac{3x_2}{x_2}$$

$$x_1/x_2 = 3/1$$

$$x_1 = 3 \quad ; \quad x_2 = 1$$

into eqn (i)

$$3 - 6(1) + x_3 = 0$$

$$3 - 6 + x_3 = 0$$

$$x_3 = 3$$

$$\text{Hence } x_1 = \begin{pmatrix} 3 \\ 1 \\ 3 \end{pmatrix}$$

When $\lambda = 2$

$$\begin{bmatrix} 5-\lambda & -6 & 1 \\ 1 & 1-\lambda & 0 \\ 3 & 0 & 1-\lambda \end{bmatrix}$$

$$\begin{bmatrix} 3 & -6 & 1 \\ 1 & -1 & 0 \\ 3 & 0 & -1 \end{bmatrix} \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

$$3x_1 - 6x_2 + x_3 = 0 \quad - \text{i}$$

$$x_1 - x_2 + 0 = 0 \quad - \text{ii}$$

$$3x_1 + 0 - x_3 = 0 \quad - \text{iii}$$

Eq ii

$$\frac{x_1}{x_2} = \frac{x_2}{x_2}$$

$$x_1/x_2 = 1/1$$

$$x_1 = 1, \quad x_2 = 1$$

Eq iii

$$3(1) - 6(1) + x_3 = 0$$

$$3 - 6 + 3x_3 = 0$$

$$x_3 = 3$$

Hence x_2

$$\begin{pmatrix} 1 \\ 1 \\ 3 \end{pmatrix}$$