Assignment 2

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Matrices

***Abstract*—This documnet contains the solution to find the value of given Matrix Equation**

Download all python codes from

https://github.com/shivangi-975/EE5609-Matrix_Theory/tree/master/Assignment2/Codes

Download latex-tikz codes from

https://github.com/shivangi-975/EE5609-Matrix_Theory/blob/master/Assignment2/Assignment2.tex

1 Problem

Find the value of equation $A^2 - 5A + 6I$

$$If A = \begin{pmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{pmatrix}$$

2 Solution

Given equation $A^2 - 5A + 6I$

$$A - \lambda I = \begin{pmatrix} 2-\lambda & 0 & 1 \\ 2 & 1-\lambda & 3 \\ 1 & -1 & 0-\lambda \end{pmatrix} \tag{2.0.1}$$

Solving characteristic equation we have :

$$\lambda^3 - 3\lambda^2 + 4\lambda - 3 = 0 \tag{2.0.2}$$

$$A^3 - 3A^2 + 4A = 3 \tag{2.0.3}$$

$$A^2 - 5A + 6 = 3A^{-1} - 2A + 2 \tag{2.0.4}$$

$$3A^{-1} = \begin{pmatrix} 3 & -1 & -1 \\ 3 & -1 & -4 \\ -3 & 2 & 2 \end{pmatrix} \tag{2.0.5}$$

$$-2A = \begin{pmatrix} -4 & 0 & -2 \\ -4 & -2 & -6 \\ -2 & 2 & 0 \end{pmatrix} \tag{2.0.6}$$

$$2I = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix} \tag{2.0.7}$$

Writing the equation by putting values we have: $A^2 - 5A + 6I = 3A^{-1} - 2A + 2$

$$\begin{pmatrix} 3 & -1 & -1 \\ 3 & -1 & -4 \\ -3 & 2 & 2 \end{pmatrix} + \begin{pmatrix} -4 & 0 & -2 \\ -4 & -2 & -6 \\ -2 & 2 & 0 \end{pmatrix} + \begin{pmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{pmatrix} \tag{2.0.8}$$

Solving equation we have: $A^2 - 5A + 6I =$

$$\begin{pmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & 4 & 4 \end{pmatrix} \tag{2.0.9}$$