

# Assignment-3

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**Abstract—**In this work, we evaluate the matrix equation, to get the value of 'k'.

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Considering the given equation:  $A^2 = kA - 2I$ , from (2.0.5) and (2.0.8) we get

$$\begin{pmatrix} 1 & -2 \\ 4 & -4 \end{pmatrix} = \begin{pmatrix} 3k-2 & -2k \\ 4k & -2k-2 \end{pmatrix} \quad (2.0.9)$$

Hence, k can be obtained by comparing the respective elements in both the matrices. i.e.,

$$1 = 3k - 2 \quad (2.0.10)$$

$$\Rightarrow 1 + 2 = 3k \quad (2.0.11)$$

$$\Rightarrow k = 1 \quad (2.0.12)$$

## 1 PROBLEM STATEMENT

If  $A = \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix}$  and  $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ , find k so that  $A^2 = kA - 2I$

## 2 SOLUTION

$$\text{Given : } A = \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix}, \quad (2.0.1)$$

$$A^2 = AA \quad (2.0.2)$$

$$= \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix} \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix} \quad (2.0.3)$$

$$= \begin{pmatrix} 9-8 & -6+4 \\ 12-8 & -8+4 \end{pmatrix} \quad (2.0.4)$$

$$= \begin{pmatrix} 1 & -2 \\ 4 & -4 \end{pmatrix} \quad (2.0.5)$$

$$kA - 2I = k \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix} - 2 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad (2.0.6)$$

$$= \begin{pmatrix} 3k & -2k \\ 4k & -2k \end{pmatrix} - \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix} \quad (2.0.7)$$

$$= \begin{pmatrix} 3k-2 & -2k \\ 4k & -2k-2 \end{pmatrix} \quad (2.0.8)$$