AI1110 Assignment 1

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I. Question 3 (a)

Question:

Simplify

$$\sin A \begin{bmatrix} \sin A & -\cos A \\ \cos A & \sin A \end{bmatrix} + \cos A \begin{bmatrix} \cos A & \sin A \\ -\sin A & \cos A \end{bmatrix}$$

Solution:

Let,

$$R = \begin{bmatrix} \cos A & -\sin A \\ \sin A & \cos A \end{bmatrix}$$

The matrix expression in the question can be written as

$$\sin A \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} R^{-1} + \cos A * R^{-1}$$

Taking R^{-1} common

$$\left(\sin A \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} + \cos A \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right) R^{-1}$$

Simplifying the expression

$$\begin{bmatrix} \cos A & -\sin A \\ \sin A & \cos A \end{bmatrix} R^{-1}$$

Multiplying the matrices finally gives

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$