Matrices: Identity Matrix, Inverse Matrix

Identity Matrices:

(2X2): $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (3X3): $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (4X4): $I = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

Inverse Matrix:

(2X2): $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}, \; A^{-1} = \frac{1}{ad - bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

Ex:

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

$$A^{-1} = \frac{1}{1(6) - (-3)(5)}\begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix} = \frac{1}{6+15}\begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix} = \frac{1}{21}\begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix} = \begin{bmatrix} 6/21 & 3/21 \\ -5/21 & 1/21 \end{bmatrix}$$

To CHECK:

Rule: $A \times A^{-1} = I$

$$A \times A^{-1} = \begin{bmatrix} 1 & -3 \\ 5 & 6 \end{bmatrix} \times \begin{bmatrix} 6/21 & 3/21 \\ -5/21 & 1/21 \end{bmatrix} = \begin{bmatrix} 1 & -3 \\ 5 & 6 \end{bmatrix} \times \frac{1}{21}\begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix} = \frac{1}{21}\begin{bmatrix} 1 & -3 \\ 5 & 6 \end{bmatrix} \times \begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix}$$

$$= \frac{1}{21}\begin{bmatrix} 1 & -3 \\ 5 & 6 \end{bmatrix} \times \begin{bmatrix} 6 & 3 \\ -5 & 1 \end{bmatrix} = \frac{1}{21}\begin{bmatrix} 1 \cdot 6 + (-3)(-5) & 1 \cdot 3 + (-3)(1) \\ 5 \cdot 6 + 6(-5) & 5 \cdot 3 + 6 \cdot 1 \end{bmatrix} = \frac{1}{21}\begin{bmatrix} 21 & 0 \\ 0 & 21 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$$