Investigating Identity and Inverse Matrices

Let $A = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix}$.

Also consider the 2 x 2 identity matrix $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

1. Find AI and BI. What do you notice?

$AI = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ $BI = \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = B$

2. Find IA and IB. What do you notice? Is multiplication by the identity matrix commutative?

$IA = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} = A$ $IB = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix} = B$

Let $D = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$. The inverse of D is $E = \begin{bmatrix} 1 & -0.5 \\ -2 & 1.5 \end{bmatrix}$.

3. Find DE and ED. What do you notice?

$DE = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & -\frac{1}{2} \\ -2 & \frac{3}{2} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $ED = \begin{bmatrix} 1 & -\frac{1}{2} \\ -2 & \frac{3}{2} \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$