Investigating Identity and Inverse Matrices

Identity Property for Multiplication
$1 \cdot x = x$

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? The matrices don't change.

$AI = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ A↑

$BI = \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix}\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix}$ B↑

2. Find *IA* and *IB*. What do you notice? Matrices don't change. Is multiplication by the identity matrix commutative? yes

$IA = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ A↑

$IB = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix} = \begin{bmatrix} -4 & 0 \\ -7 & 6 \end{bmatrix}$ 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? A matrix multiplied by it's inverse results in the identity.

$DE = \begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}\begin{bmatrix} 1 & -.5 \\ -2 & 1.5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$ED = \begin{bmatrix} 1 & -.5 \\ -2 & 1.5 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$