Farmer Mathematics: Matrix Algebra I

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Wahoo!

1. A certain rabbit wants to find $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} \begin{bmatrix} 9 & 10 \\ 11 & 12 \end{bmatrix}$. Help him!

2. (a) Carry out the following multiplication: $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}^2 \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

   (b) Now find: $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}^{T2} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

   (c) What do you notice about the answer to part (b)?

3. (a) Find M where $M \begin{bmatrix} 5 & -7 \\ 11 & -23 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

   (b) What is M called in relation to $\begin{bmatrix} 5 & -7 \\ 11 & -23 \end{bmatrix}$?

4. Solve $\begin{bmatrix} 1 & 3 \\ 7 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 11 \\ 23 \end{bmatrix}$

Solutions

1. $\begin{bmatrix} 413 & 454 \\ 937 & 1030 \end{bmatrix}$

2. (a) $\begin{bmatrix} 30 & 36 & 42 \\ 66 & 81 & 96 \\ 102 & 126 & 150 \end{bmatrix}$

   (b) $\begin{bmatrix} 30 & 66 & 102 \\ 36 & 81 & 126 \\ 42 & 96 & 150 \end{bmatrix}$

   (c) The result is the answer to part (b) transposed.

3. (a) $\begin{bmatrix} \frac{23}{38} & \frac{-7}{38} \\ \frac{11}{38} & \frac{-5}{38} \end{bmatrix}$

   (b) The inverse of $\begin{bmatrix} 5 & -7 \\ 11 & -23 \end{bmatrix}$

4. $\left(\frac{70}{22}, \frac{16}{22} \right)$