Calculus for Biology | Newberger
Spring 2007

Drill Quiz for Chapter 10 Section 3

1. (3 points each) The following questions refer to these matrices.

$$A=\begin{bmatrix}2 & -1\\ 3 & 8\\ 3 & -13\end{bmatrix} \quad B=\begin{bmatrix}2 & -7\\ 1 & 4\end{bmatrix} \quad C=\begin{bmatrix}-1 & 0 & 2\\ 0 & 1 & 0\\ 2 & 8 & 2\end{bmatrix}$$

   Which of the following products make sense? If the product makes sense, do the matrix multiplication. If the product does not make sense, explain why.

   a. AB

$$AB=\begin{bmatrix}2 & -1\\ 3 & 8\\ 3 & -13\end{bmatrix}\begin{bmatrix}2 & -7\\ 1 & 4\end{bmatrix}=\begin{bmatrix}3 & -18\\ 14 & 11\\ -7 & -63\end{bmatrix}$$

   b. AC
      A is 3x2 and C is 3x3 so they cannot be multiplied.

   c. CA

$$CA=\begin{bmatrix}-1 & 0 & 2\\ 0 & 1 & 0\\ 2 & 8 & 2\end{bmatrix}\begin{bmatrix}2 & -1\\ 3 & 8\\ 3 & -13\end{bmatrix}=\begin{bmatrix}4 & -25\\ 3 & 8\\ 34 & 36\end{bmatrix}$$

2. (1 point each) Suppose A is an mxn matrix, and B is a lxk matrix.

   a. What must be true about n and l if the product AB makes sense?

      We must have $n = l$, since the number of columns in the first matrix must be the same as the number of rows in the second matrix.

   b. What must be true about m, n, l and k if the products AB and BA both make sense?

      We must have $n = l$, since, to make AB work, the number of columns in A must be the same as the number of rows in B. We must also have $m = k$, since, to make BA work, the number of columns in B must be the same as the number of rows in A. For example, A could be 2x3 and B could be 3x2.

3. (4 points) Give an example of two 2x2 matrices, A and B so that AB and BA are different. (This means you should invent two 2x2 matrices, and then multiply them to show the two products have different answers).

   $A=\begin{bmatrix}2 & 0\\ 1 & 0\end{bmatrix}$ $B=\begin{bmatrix}1 & 0\\ 0 & 4\end{bmatrix}$. Then $AB=\begin{bmatrix}2 & 0\\ 1 & 0\end{bmatrix}\begin{bmatrix}1 & 0\\ 0 & 4\end{bmatrix}=\begin{bmatrix}0 & 0\\ 1 & 0\end{bmatrix}$ and
   $BA=\begin{bmatrix}1 & 0\\ 0 & 4\end{bmatrix}\begin{bmatrix}2 & 0\\ 1 & 0\end{bmatrix}=\begin{bmatrix}2 & 0\\ 4 & 0\end{bmatrix}$ so AB does not equal BA.