Solutions to the Attendance Quiz for Sept. 23, 2010

Let

\[ A = \begin{bmatrix} -2 & 4 \\ 5 & 7 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & -1 & 3 \\ 2 & 3 & 0 \end{bmatrix}. \]

Compute the following expressions, or give a reason why the expression is nonsense.

1. **AB**

   **Sol. of 1:**

   \[ AB = \begin{bmatrix} -2 & 4 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} (-2) \cdot (1) + (4) \cdot (2) & (-2) \cdot (-1) + (4) \cdot (3) \\ (5) \cdot (1) + (7) \cdot (2) & (5) \cdot (-1) + (7) \cdot (3) \end{bmatrix} = \begin{bmatrix} -2 + 8 & 2 + 12 \\ 5 + 14 & -5 + 21 \end{bmatrix} = \begin{bmatrix} 6 & 14 \\ 19 & 16 \end{bmatrix}. \]

   **Comment:** About 85% of the people got it right. Most of the other people did it the right way, but messed up with the arithmetics.

2. **BA**

   **Sol. of 2:**

   \[ BA = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} -2 & 4 \\ 5 & 7 \end{bmatrix} = \begin{bmatrix} (1) \cdot (-2) + (-1) \cdot (5) & (1) \cdot (4) + (-1) \cdot (7) \\ (2) \cdot (-2) + (3) \cdot (5) & (2) \cdot (4) + (3) \cdot (7) \end{bmatrix} = \begin{bmatrix} -2 - 5 & 4 - 7 \\ -4 + 15 & 8 + 21 \end{bmatrix} = \begin{bmatrix} -7 & -3 \\ 11 & 29 \end{bmatrix}. \]

   **Comment:** About 85% of the people got it right. Most of the other people did it the right way, but messed up with the arithmetics.

3. **AC^T**

   **Sol. of 3:** \( A \) is a 2 \( \times \) 2 matrix and \( C^T \) is a 3 \( \times \) 2 matrix.

   You can’t multiply them, since the number of columns of \( A \) (2) is different than the number of rows (3) of \( C^T \).

   **Comment:** About 75% of the people got it right. Some people got confused and did \((AC)^T\). \( AC^T \) means you first take the transpose of \( C \), and then multiply \( A \) by \( C^T \).

4. **BC**

   **Sol. of 4:**

   \[ BC = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 1 & -1 & 3 \\ 2 & 3 & 0 \end{bmatrix} \]
\[
\begin{bmatrix}
(1) \cdot (1) + (-1) \cdot (2) & (1) \cdot (-11) + (-1) \cdot (3) & (1) \cdot (3) + (-1) \cdot (0)
\end{bmatrix} = \begin{bmatrix}
1 - 2 & -1 - 3 & 3 + 0
\end{bmatrix} = \begin{bmatrix}
-1 & -4 & 3
\end{bmatrix}
\]

Comment: About 70% of the people got it right. Some of the other people did it the right way, but messed up with the arithmetics, and some ran out of time.