Solutions to Attendance Quiz for Lecture 10

1. Compute the product of the partitioned matrix using block multiplication.

$$\begin{bmatrix} 2 & 0 \\ --- & --- \\ 3 & 1 \\ -1 & 5 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} -1 & |2 & 3 & 0 \\ 2 & |2 & -1 & 2 \end{bmatrix}$$

Sol. of 1 Let's give the blocks names

$$\begin{bmatrix} A_1 \\ A_2 \end{bmatrix} [\, B_1 \quad B_2 \,]$$

Pretending that the blocks are just numbers, we get

$$\begin{bmatrix} A_1 B_1 & A_1 B_2 \\ A_2 B_1 & A_2 B_2 \end{bmatrix}$$

Where

$$A_1 = [\, 2 \quad 0 \,] \quad , \quad A_2 = \begin{bmatrix} 3 & 1 \\ -1 & 5 \\ 1 & 2 \end{bmatrix} \quad , \quad B_1 = \begin{bmatrix} -1 \\ 2 \end{bmatrix} \quad , \quad B_2 = \begin{bmatrix} 2 & 3 & 0 \\ 2 & -1 & 2 \end{bmatrix} \quad .$$

Now do the four matrix-multiplications:

$$A_1 B_1 = [\, 2 \quad 0 \,] \begin{bmatrix} -1 \\ 2 \end{bmatrix} = (2)(-1) + (0)(2) = [-2]$$

$$A_1 B_2 = [\, 2 \quad 0 \,] \begin{bmatrix} 2 & 3 & 0 \\ 2 & -1 & 2 \end{bmatrix} = [\, (2)(2) + 0(2) \quad (2)(3) + (0)(-1) \quad (2)(0) + (0)(2) \,] = [\, 4 \quad 6 \quad 0 \,]$$

$$A_2 B_1 = \begin{bmatrix} 3 & 1 \\ -1 & 5 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} (3)(-1) + (1)(2) \\ (-1)(-1) + (5)(2) \\ (1)(-1) + (2)(2) \end{bmatrix} = \begin{bmatrix} -1 \\ 11 \\ 3 \end{bmatrix} =$$

$$A_2 B_2 = \begin{bmatrix} 3 & 1 \\ -1 & 5 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 2 & 3 & 0 \\ 2 & -1 & 2 \end{bmatrix} = \begin{bmatrix} (3)(2) + (1)(2) & (3)(3) + (1)(-1) & (3)(0) + (1)(2) \\ (-1)(2) + (5)(2) & (-1)(3) + (5)(-1) & (-1)(0) + (5)(2) \\ (1)(2) + (2)(2) & (1)(3) + (2)(-1) & (1)(0) + (2)(2) \end{bmatrix} = \begin{bmatrix} 8 & 8 & 2 \\ 8 & -8 & 10 \\ 6 & 1 & 4 \end{bmatrix}$$

Putting it altogether we have

$$\begin{bmatrix} -2 & 4 & 6 & 0 \\ -1 & 8 & 8 & 2 \\ 11 & 8 & -8 & 10 \\ 3 & 6 & 1 & 4 \end{bmatrix} \quad .$$

This is the **answer**.

Comments: About %60 of the students got it compeletely. The others messed up to varying degrees.