QUIZ 19: LESSONS 31-32
APRIL 14, 2017

Write legibly, clearly indicate the question you are answering, and put a box or circle around your final answer. If you do not clearly indicate the question numbers, I will take off points. If you have any questions, raise your hand and I will come over to you.

1. [3 pts] Using row operations, put the following matrix into reduced row-echelon form

$$\left[\begin{array}{cc|c} -3 & 6 & 9 \\ 5 & -12 & -11 \end{array}\right]$$

Clearly label each row-operation you use.

Solution: Write

$$\left[\begin{array}{cc|c} -3 & 6 & 9 \\ 5 & -12 & -11 \end{array}\right] \xrightarrow{-\frac{R_1}{3}\to R_1} \left[\begin{array}{cc|c} 1 & -2 & -3 \\ 5 & -12 & -11 \end{array}\right]$$

$$\xrightarrow{-5R_1+R_2\to R_2} \left[\begin{array}{cc|c} 1 & -2 & -3 \\ 0 & -2 & 4 \end{array}\right]$$

$$\xrightarrow{-\frac{R_2}{2}\to R_2} \left[\begin{array}{cc|c} 1 & -2 & -3 \\ 0 & 1 & -2 \end{array}\right]$$

$$\xrightarrow{2R_2+R_1\to R_1} \left[\begin{array}{cc|c} 1 & 0 & -7 \\ 0 & 1 & -2 \end{array}\right]$$

2. Let

$$A = \begin{bmatrix} -1 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}, C = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 1 & 1 \end{bmatrix}.$$

Compute the following matrix operations. If the operation is not defined, write **not defined**.

(a) [1 pt] $3A$

Solution: $3A = 3\begin{bmatrix} -1 & 0 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 3(-1) & 3(0) \\ 3(1) & 3(1) \end{bmatrix} = \begin{bmatrix} -3 & 0 \\ 3 & 3 \end{bmatrix}$

(b) [2 pts] $3A - 2C$

Solution: Because $3A$ is a 2×2-matrix and $2C$ is a 3×2-matrix, this operation is **not defined**.

(c) [2 pts] AC

Solution: Because A is a 2×2-matrix and C is a 3×2 matrix, AC is **not defined**.

(d) [2 pts] CB

Solution:

$$CB = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 1(2)+(-1)(1) & 1(-1)+(-1)(0) \\ 0(2)+2(1) & 0(-1)+2(0) \\ 1(2)+1(1) & 1(-1)+1(0) \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 2 & 0 \\ 3 & -1 \end{bmatrix}$$