# Lab Assignment 4 – 12/4/2019 (Extra Credit) - Solution

Points Possible: 5

For all problems. Show your work. Otherwise, you will get points deducted, up to and including receiving zero credit.

(5 points)

Use Gaussian Elimination to convert matrix A to reduced row echelon form, assuming matrix A is

$$\begin{bmatrix} 4 & -3 & 1 & -10 \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

**Solution:**

**Row Operation 1:**

$$\begin{bmatrix} 4 & -3 & 1 & -10 \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

multiply the 1st row by **1/4**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

**Row Operation 2:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 2 & 1 & 3 & 0 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

add -**2** times the 1st row to the 2nd row

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & \frac{5}{2} & \frac{5}{2} & 5 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

**Row Operation 3:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & \frac{5}{2} & \frac{5}{2} & 5 \\ -1 & 2 & -5 & 17 \end{bmatrix}$$

add **1** times the 1st row to the 3rd row

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & \frac{5}{2} & \frac{5}{2} & 5 \\ 0 & \frac{5}{4} & -\frac{19}{4} & \frac{29}{2} \end{bmatrix}$$

**Row Operation 4:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & \frac{5}{2} & \frac{5}{2} & 5 \\ 0 & \frac{5}{4} & -\frac{19}{4} & \frac{29}{2} \end{bmatrix}$$

multiply the 2nd row by **2/5**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & \frac{5}{4} & -\frac{19}{4} & \frac{29}{2} \end{bmatrix}$$

**Row Operation 5:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & \frac{5}{4} & -19 & 29 \end{bmatrix}$$

add $-\frac{5}{4}$ times the 2nd row to the 3rd row

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -6 & 12 \end{bmatrix}$$

**Row Operation 6:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -6 & 12 \end{bmatrix}$$

multiply the 3rd row by $-\frac{1}{6}$

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

**Row Operation 7:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

add $-1$ times the 3rd row to the 2nd row

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

**Row Operation 8:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & \frac{1}{4} & -\frac{5}{2} \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

add $-\frac{1}{4}$ times the 3rd row to the 1st row

$$\begin{bmatrix} 1 & -\frac{3}{4} & 0 & -2 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

**Row Operation 9:**

$$\begin{bmatrix} 1 & -\frac{3}{4} & 0 & -2 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

add $\frac{3}{4}$ times the 2nd row to the 1st row

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$