Name: **Math 308-M**

Student ID #: **Quiz 1**

1. **[6 points]** Write the following augmented matrix in **reduced** echelon form:

$$\begin{bmatrix} 1 & 1 & -4 & -1 & 6 \\ -3 & -1 & 16 & 5 & -2 \\ 1 & 0 & -6 & 0 & 4 \end{bmatrix} \begin{matrix} \\ \to R_2+3R_1 \\ \to R_3-R_1 \end{matrix}$$

$$\sim \begin{bmatrix} 1 & 1 & -4 & -1 & 6 \\ 0 & 2 & 4 & 2 & 16 \\ 0 & -1 & -2 & 1 & -2 \end{bmatrix} \div 2 \sim \begin{bmatrix} 1 & 1 & -4 & -1 & 6 \\ 0 & 1 & 2 & 1 & 8 \\ 0 & -1 & -2 & 1 & -2 \end{bmatrix} \to R_3+R_2$$

$$\sim \begin{bmatrix} 1 & 1 & -4 & -1 & 6 \\ 0 & 1 & 2 & 1 & 8 \\ 0 & 0 & 0 & 2 & 6 \end{bmatrix} \div 2 \sim \begin{bmatrix} 1 & 1 & -4 & -1 & 6 \\ 0 & 1 & 2 & 1 & 8 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix} \begin{matrix} \to R_1+R_3 \\ \to R_2-R_3 \end{matrix}$$

$$\sim \begin{bmatrix} 1 & 1 & -4 & 0 & 9 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix} \to R_1-R_2 \sim \boxed{\begin{bmatrix} 1 & 0 & -6 & 0 & 4 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 0 & 1 & 3 \end{bmatrix}}$$

2. **[2 points]** Write one (just one!) solution to this system of linear equations:

coefficients same as matrix in #1, so general solution:

$$\begin{aligned} x_1 + x_2 - 4x_3 - x_4 &= 6 \\ -3x_1 - x_2 + 16x_3 + 5x_4 &= -2 \\ x_1 - 6x_3 &= 4 \end{aligned}$$

$x_1 - 6x_3 = 4$

$x_2 + 2x_3 = 5$

$x_4 = 3$

Where x_3 is a free variable. So e.g. let $x_3=0$, $x_1=4$, $x_2=5$:

$\boxed{(4, 5, 0, 3)}$

3. **[2 points]** Write a matrix with three columns and four rows which is in echelon form, but *not* reduced echelon form.

For example: $\boxed{\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \\ 0 & 0 & 0 \end{bmatrix}}$