Name: **Math 308-L**

Student ID #: **Quiz 2**

1. **[5 points]** Find a value of x for which the following vectors are linearly **dependent**:

$$\begin{bmatrix} 5 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 7 \\ -4 \\ 8 \end{bmatrix}, \begin{bmatrix} 1 \\ 5 \\ x \end{bmatrix}$$

let's reduce this matrix:

$$\begin{bmatrix} 5 & 7 & 1 \\ -1 & -4 & 5 \\ 2 & 8 & x \end{bmatrix} \sim \begin{bmatrix} -1 & -4 & 5 \\ 5 & 7 & 1 \\ 2 & 8 & x \end{bmatrix} \begin{matrix} \\ \to R_2+5R_1 \\ \to R_3+2R_1 \end{matrix}$$

$$\sim \begin{bmatrix} -1 & -4 & 5 \\ 0 & -13 & 26 \\ 0 & 0 & x+10 \end{bmatrix}$$

dependent if some column has no pivot, i.e. if $x+10=0$

$$\boxed{x=-10}$$

2. **[2 points]** For that value of x, describe span $\left\{ \begin{bmatrix} 5 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 7 \\ -4 \\ 8 \end{bmatrix}, \begin{bmatrix} 1 \\ 5 \\ x \end{bmatrix} \right\}$ geometrically.

Well, there's a row of all 0's in the above matrix, so it's not all of $\mathbb{R}^3$.

The span is just a plane in $\mathbb{R}^3$.

3. **[3 points]** Find *all* values of x for which the following vectors are linearly **dependent**.

Any real number! There are more vectors than dimensions, so they are always linearly dependent.

$$\begin{bmatrix} 1 \\ 0 \\ 7 \end{bmatrix}, \begin{bmatrix} 5 \\ -1 \\ 2 \end{bmatrix}, \begin{bmatrix} 7 \\ -4 \\ 8 \end{bmatrix}, \begin{bmatrix} 1 \\ 5 \\ x \end{bmatrix}$$