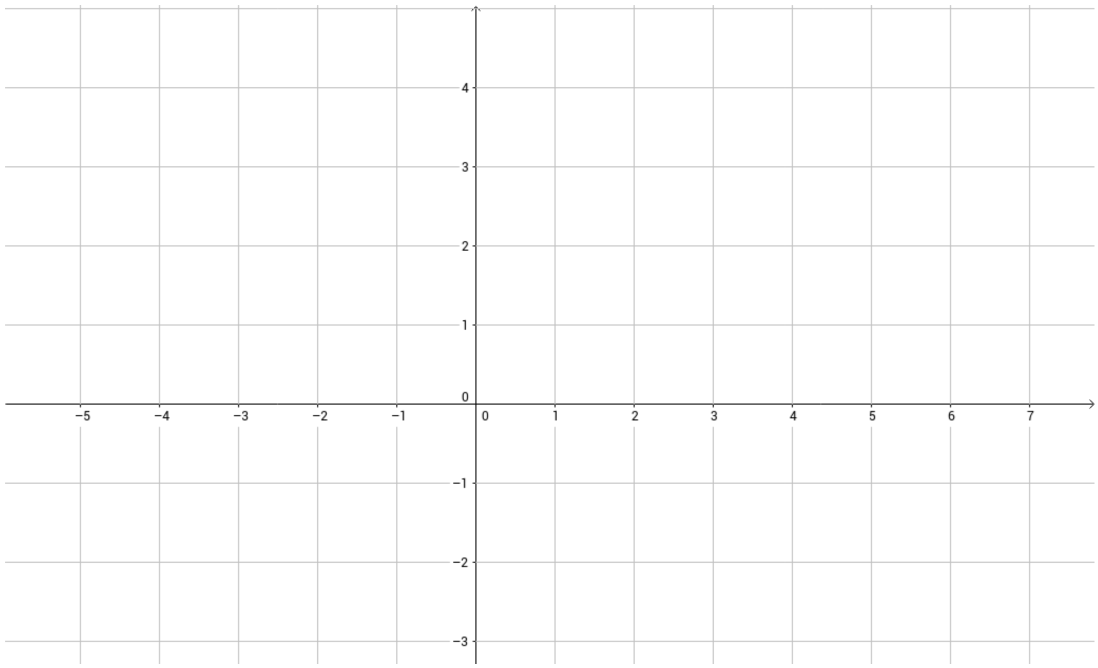
**NAME:** ________________________________________ **Quiz 2**, MTH314-001

1. Consider the following set of equations:

$$\begin{aligned} 2x + 3y &= -1 \\ -x + y &= 3. \end{aligned}$$

   (a) Draw the row picture corresponding to this set of equations. *[1 point]*




   (b) Using part (a), write $(-1, 3)$ as a linear combination of $(2, -1)$ and $(3, 1)$. *[1 point]*

2. Find a combination $a\,\vec{v}_1 + b\,\vec{v}_2 + c\,\vec{v}_3$ that gives the zero vector: *[2 points]*

$$\vec{v}_1 = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} \qquad \vec{v}_2 = \begin{bmatrix} 2 \\ -3 \\ 1 \end{bmatrix} \qquad \vec{v}_3 = \begin{bmatrix} 3 \\ -3 \\ 0 \end{bmatrix}$$

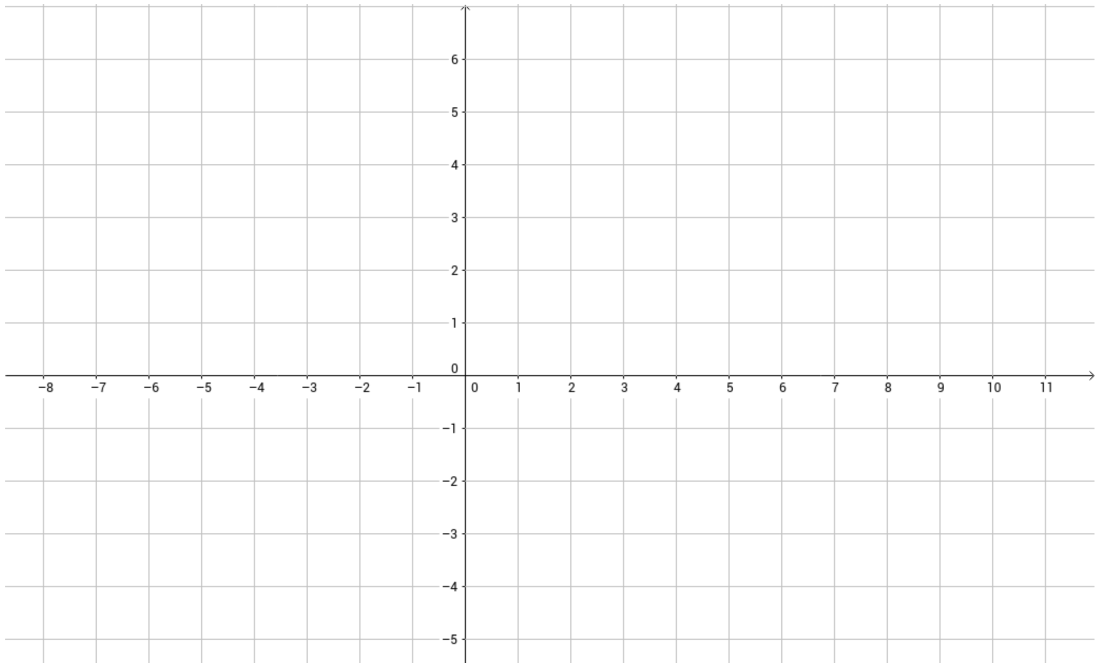
(Circle the correct choices)

These vectors are: independent dependent

The three vectors lie on a: line plane 3D space

3. Consider the two equations $-y = 2x + 1$ and $-2y = 4x - 4$.

   (a) Draw the column picture corresponding to this set of equations. *[1 point]*




   (b) Using your graph from part (a), explain why the following matrix–vector equation does not have a solution. *[1 point]*

$$\begin{pmatrix} -2 & -1 \\ -4 & -2 \end{pmatrix} \vec{x} = \begin{pmatrix} 1 \\ -4 \end{pmatrix}.$$

4. Which number $p$ makes this system singular and which right hand side $q$ gives infinitely many solutions? Find the solution that has $x_3 = 1$. **Show all steps used to arrive at your answer**. *[4 points]*

$$\begin{aligned} x_1 + 2x_2 - 3x_3 &= 2 \\ 2x_1 + 6x_2 + x_3 &= 7 \\ 2x_2 + px_3 &= q. \end{aligned}$$