Linear Combinations Homework Problems   **Math 231**

1. Express the linear combination

$$3 \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} + 2 \begin{pmatrix} -1 \\ 2 \\ 1 \end{pmatrix} - 7 \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

   using matrix notation.

2. Express the system of equations

$$2x + 3y + 4z = 5$$
$$x + 2y + 3z = 2$$
$$x + y + z = 3$$

   As a linear combination of vectors (where the coefficients are x, y, and z). *You don't need to solve the system or use matrix notation.*

3. Solve the system of equations expressed by the following matrix equation.

$$\begin{pmatrix} 1 & 2 \\ -2 & 5 \\ -5 & 6 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 4 \\ -3 \end{pmatrix}.$$

4. Find the following or explain why the linear combination does not make sense.

   (a) $\begin{pmatrix} 1 & 5 & -2 & 0 \\ -3 & 1 & 9 & -5 \\ 4 & -8 & -1 & 7 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}.$

   (b) $\begin{pmatrix} 1 & 4 & 0 \\ -1 & 0 & -2 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \\ 2 \end{pmatrix}.$

5. Draw a picture showing the how the linear combination below can be reached using the two column vectors $\begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$.

$$\begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} -2 \\ 1 \end{pmatrix} = \begin{pmatrix} -6 \\ -3 \end{pmatrix}$$