Supplementary homework problems for week 5.

1. Let $X = \{\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3\}$ where

$$\mathbf{x}_1 = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \mathbf{x}_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}, \mathbf{x}_3 = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$$

   (a) Is the vector $\mathbf{u} = \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$ in Span(X)? If so, write $\mathbf{u}$ as a linear combination of $\mathbf{x}_1$,$\mathbf{x}_2$, and $\mathbf{x}_3$.

   (b) Is the vector $\mathbf{w} = \begin{bmatrix} 1 \\ -2 \\ -2 \end{bmatrix}$ in Span(X)? If so, write $\mathbf{w}$ as a linear combination of $\mathbf{x}_1$,$\mathbf{x}_2$, and $\mathbf{x}_3$.

2. Show that the set

$$V = \left\{ \begin{bmatrix} 0 \\ x \\ 0 \end{bmatrix} \mid x \text{ is a real number} \right\}$$

   is a subspace of $\mathbb{R}^3$. (Hint: use theorem 3.3.2 on p121)

3. Show that the set

$$W = \left\{ \begin{bmatrix} 1 \\ x \end{bmatrix} \mid x \text{ is a real number} \right\}$$

   is NOT a subspace of $\mathbb{R}^2$. (Hint: use theorem 3.3.2 on p121)