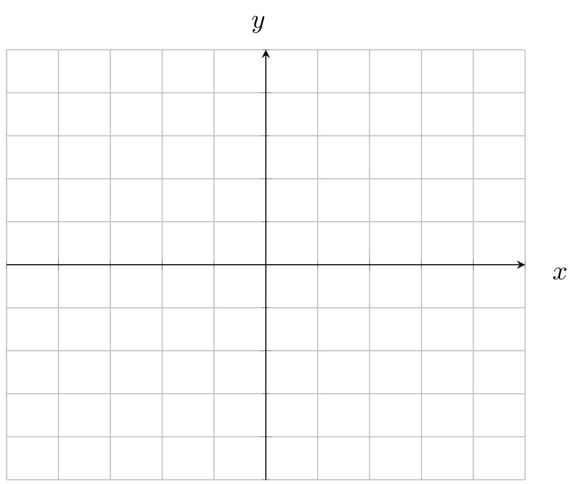
Vector Equations Worksheet

January 23, 2018

1. Fill out the columns of the following table.

Term	**Definition**	**Notation Used**
Vector		
Linear combination		
Span		

2. Draw the vectors $\boldsymbol{v} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$, $\boldsymbol{u} = \begin{bmatrix} -2 \\ 0 \end{bmatrix}$, and $\boldsymbol{v} + \boldsymbol{u}$ on the graph below.



3. For $\boldsymbol{u}$ and $\boldsymbol{v}$ above, geometrically describe $\text{Span}\{\boldsymbol{v}, \boldsymbol{u}\}$.

4. Let $\boldsymbol{u} = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}$, $\boldsymbol{v} = \begin{bmatrix} 0 \\ 4 \\ 2 \end{bmatrix}$, and $\boldsymbol{w} = \begin{bmatrix} -3 \\ 2 \\ -1 \end{bmatrix}$. Compute the following,

a. $\boldsymbol{v} - \boldsymbol{w}$

b. $\boldsymbol{u} + 3\boldsymbol{v}$

c. $2\boldsymbol{w} + \boldsymbol{v}$

d. $\boldsymbol{w} + \boldsymbol{u} - 2\boldsymbol{v}$

5. a. Let $\boldsymbol{u} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\boldsymbol{v} = \begin{bmatrix} 2 \\ -3 \end{bmatrix}$. Find c_1 and c_2 (constants) such that $c_1\boldsymbol{u} + c_2\boldsymbol{v} = \begin{bmatrix} 7 \\ -6 \end{bmatrix}$.

b. Is $\begin{bmatrix} 7 \\ -6 \end{bmatrix}$ in Span$\{\boldsymbol{u}, \boldsymbol{v}\}$?

6. a. Let $\boldsymbol{a_1} = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$, $\boldsymbol{a_2} = \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$, and $\boldsymbol{b} = \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}$. Does the equation $x_1\boldsymbol{a_1} + x_2\boldsymbol{a_2} = \boldsymbol{b}$ have a solution? If so, what is it?

b. Rewrite the above equation as a linear system and in matrix form.