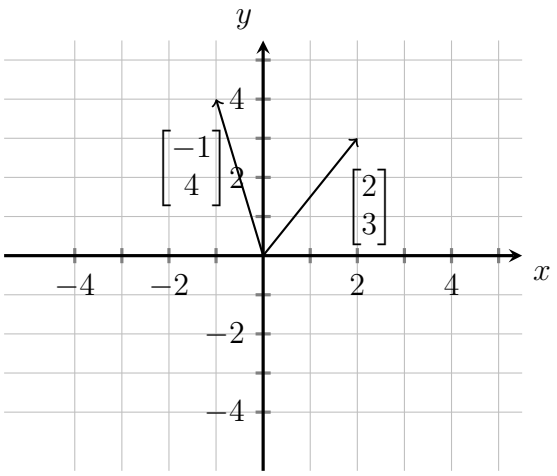
Math 214 Spring 2017
Linear Algebra HW 1 Solutions
Due Friday, January 27

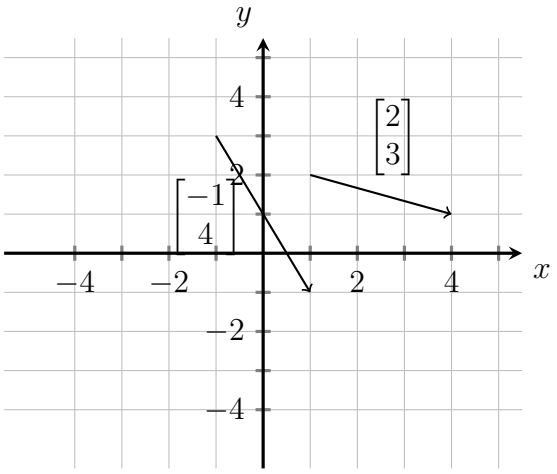
1. (a) Draw a graph of the Cartesian plane with $\begin{bmatrix}2\\3\end{bmatrix}$ and $\begin{bmatrix}-1\\4\end{bmatrix}$ in standard position.

Solution:



(b) Draw a graph of the Cartesian plane with the vector $\begin{bmatrix}3\\-1\end{bmatrix}$ with its tail at the point $(1, 2)$, and the vector $\begin{bmatrix}2\\-4\end{bmatrix}$ with its tail at $(-1, 3)$.

Solution:



2. Use the picture below to:

   (a) Write the vector $\overrightarrow{AB}$ in standard vector notation.

   Solution: $\overrightarrow{AB} = \begin{bmatrix} 3 \\ -7 \end{bmatrix}$.

   (b) Write the vector $\mathbf{v}$ in standard vector notation.

   Solution: $\mathbf{v} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$.

   (c) Find the vector $\mathbf{u} + \mathbf{w}$ and write it in standard vector notation. **Solution:** $\mathbf{u} + \mathbf{w} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$.

3. (a) If $A = (2, 1)$ and $B = (-2, 2)$, write the vector $\overrightarrow{AB}$ in standard vector notation.

   Solution: $\overrightarrow{AB} = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$.

   (b) If $C = (1, -1, 0)$ and $D = (0, 1, 2)$, write the vector $\overrightarrow{CD}$ in standard vector notation. **Solution:** $\overrightarrow{CD} = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}$.

4. Compute the following:

   (a)

$$\begin{bmatrix} 1 \\ -3/2 \\ 4 \end{bmatrix} + \begin{bmatrix} -7 \\ 2 \\ 1 \end{bmatrix} = \begin{bmatrix} -6 \\ 1/2 \\ 5 \end{bmatrix} \qquad \begin{bmatrix} 1 \\ 5 \\ 3 \\ 7 \\ 2 \end{bmatrix} + \begin{bmatrix} -5 \\ -3 \\ 1 \\ \pi \\ 2 \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \\ 4 \\ 7+\pi \\ 4 \end{bmatrix}$$

5. Compute the following:

$$e \cdot \begin{bmatrix} 2 \\ 1 \\ -2 \\ -3 \end{bmatrix} = \begin{bmatrix} 2e \\ e \\ -2e \\ -3e \end{bmatrix} \qquad -3 \cdot \begin{bmatrix} -7 \\ 3 \\ 1 \end{bmatrix} = \begin{bmatrix} 21 \\ -9 \\ -3 \end{bmatrix}$$

6. Let $\mathbf{u} = \begin{bmatrix} -1 \\ 0 \\ 3 \end{bmatrix}$, let $\mathbf{v} = \begin{bmatrix} 4 \\ -2 \\ 7 \end{bmatrix}$, and let $\mathbf{w} = \begin{bmatrix} 0 \\ 5 \\ -3 \end{bmatrix}$.

   (a) Compute $2\mathbf{v} + 3\mathbf{u}$

   Solution:

$$2\mathbf{v} + 3\mathbf{u} = \begin{bmatrix} 8 \\ -4 \\ 14 \end{bmatrix} + \begin{bmatrix} -3 \\ 0 \\ 9 \end{bmatrix} = \begin{bmatrix} 5 \\ -4 \\ 23 \end{bmatrix}.$$

(b) Compute $5\mathbf{u} + 2\mathbf{w}$.

Solution:

$$5\mathbf{u} + 2\mathbf{w} = \begin{bmatrix} -5 \\ 0 \\ 15 \end{bmatrix} + \begin{bmatrix} 0 \\ 10 \\ -6 \end{bmatrix} = \begin{bmatrix} -5 \\ 10 \\ 9 \end{bmatrix}.$$