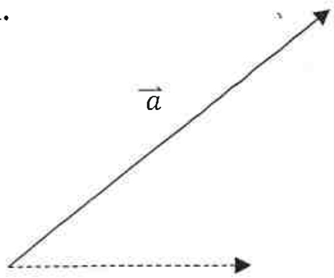
6.03 Notes: More Geometric Vectors

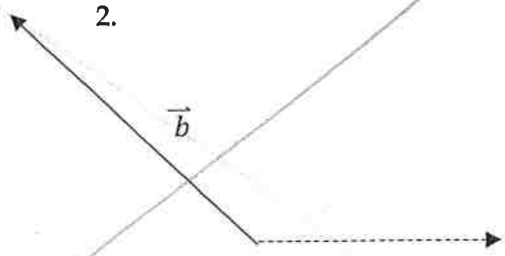
- Use a ____________________ to measure the magnitude of a vector.
- Use a ____________________ to measure the direction of a vector.

Examples: Measure the magnitude (in cm) and direction (in degrees) of each vector.

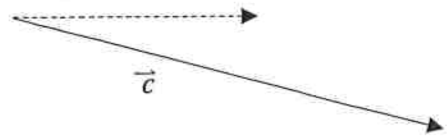
1.



2.



3.



Mag = ______ Dir = ______ Mag = ______ Dir = ______ Mag = ______ Dir = ______

Now, draw each vector diagram and find the magnitude and direction of the resultant vector.

4. $\vec{a} + \vec{b}$

5. $2\vec{c} - \vec{a}$

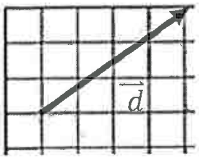
When a grid is used, first find the component form: <horizontal displacement, vertical displacement>. Then:

- Use a $\vec{v} = \sqrt{a^2+b^2}$ to calculate the magnitude of a vector.
- Use a $\theta = \tan^{-1}(b/a)$ to calculate the direction of a vector.

Caution: The calculator is not always right!

Examples: Find the component form, magnitude, and direction (using standard position) of $\vec{d}$ and $\vec{e}$.

6.

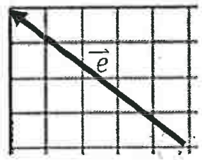


$\langle 4, 3 \rangle$

$|\vec{d}| = \sqrt{4^2+3^2} = 5$

$\theta = \tan^{-1}\left(\frac{3}{4}\right) = \boxed{36.87^\circ}$

7.



$\langle -5, 4 \rangle$

$|\vec{e}| = \sqrt{4^2+5^2} = \sqrt{41}$

$\theta = \tan^{-1}\left(\frac{4}{-5}\right) = -38.66^\circ$

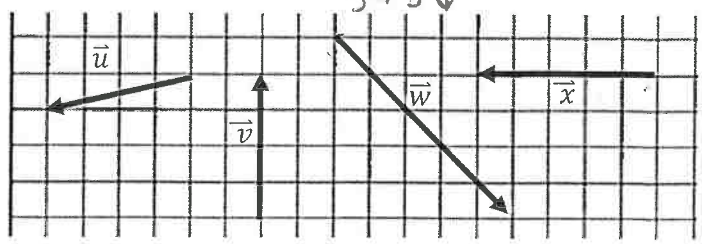
$+180$

$\boxed{\theta = 141.34^\circ}$

6.03 Practice: More Geometric Vectors

Use the vectors to the right to complete problems #1 – 6. Round answers to the nearest thousandth. Use standard position for the direction of a vector.

5 → 5 ↓



1. Find the component form, magnitude, and direction of $\vec{x}$.

$\langle -5, 0 \rangle$

magnitude: $|\vec{x}| = \sqrt{(-5)^2 + 0^2} = \boxed{5}$

direction $\theta = \tan^{-1}\left(\frac{0}{-5}\right) = 0 \rightarrow \boxed{180^\circ}$

2. Find the component form, magnitude, and direction of $\vec{u}$.

$\langle -4, -1 \rangle$

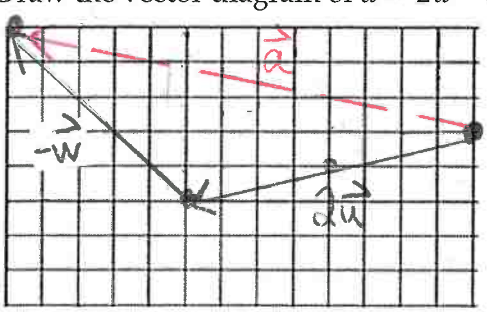
$|\vec{u}| = \sqrt{(-4)^2 + (-1)^2} = \sqrt{17}$

$\theta = \tan^{-1}\left(\frac{-1}{-4}\right) = 14.036^\circ$

$+180$

$\boxed{194.036^\circ}$

3. Draw the vector diagram of $\vec{a} = 2\vec{u} - \vec{w}$.



Component form of $\vec{a}$: $\langle -13, 3 \rangle$

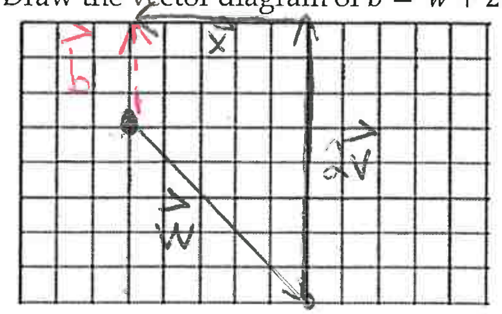
Magnitude = $\sqrt{178}$ Direction = 167.005°

$\sqrt{(-13)^2 + (3)^2} =$

$\theta = \tan^{-1}\left(\frac{3}{-13}\right) = -12.995$

$+180$

4. Draw the vector diagram of $\vec{b} = \vec{w} + 2\vec{v} + \vec{x}$

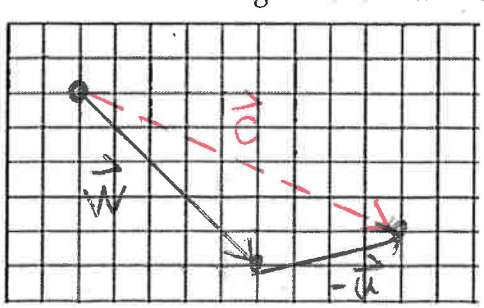


Component form of $\vec{b}$: $\langle 0, 3 \rangle$

Magnitude = 3 Direction = 90°

$\sqrt{0^2 + 3^2} =$

5. Draw the vector diagram of $\vec{c} = \vec{w} - \vec{u}$.



Component form of $\vec{c}$: $\langle 9, -4 \rangle$

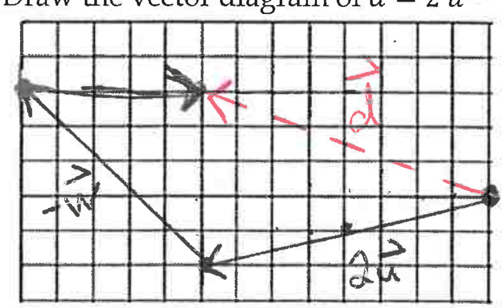
Magnitude = $\sqrt{97}$ Direction = 336.038°

$\sqrt{9^2 + (-4)^2}$

$\theta = \tan^{-1}\left(\frac{-4}{9}\right) \rightarrow -23.962$

$+360$

6. Draw the vector diagram of $\vec{d} = 2\vec{u} - \vec{w} - \vec{x}$



Component form of $\vec{d}$: $\langle -8, 3 \rangle$

Magnitude = $\sqrt{73}$ Direction = 159.444°

$\sqrt{(-8)^2 + 3^2}$

$\theta = \tan^{-1}\left(\frac{3}{-8}\right) = -20.556^\circ$

$+180$