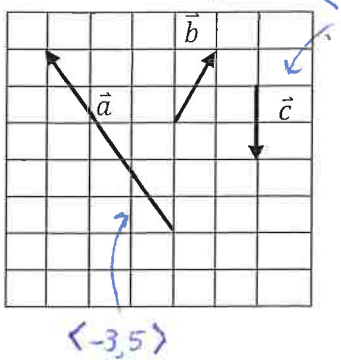
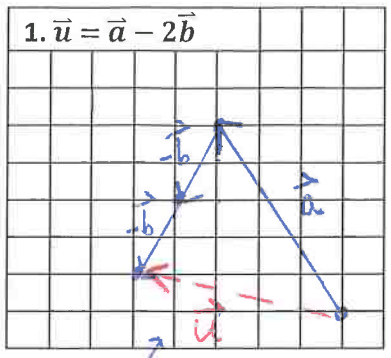
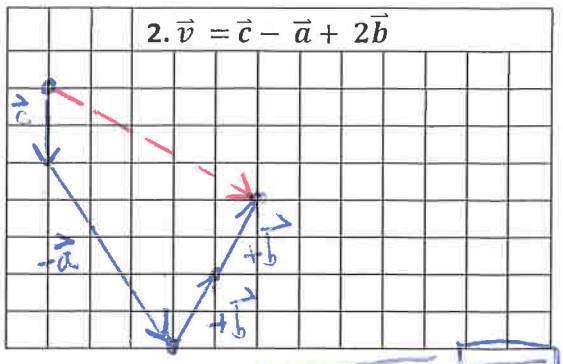
6.13 Test Review - Vectors Date: _____

Given the vectors below, draw and label the given resultant vectors.







3. a) Give the **component** form of $\vec{u}$: _____ b) Find $|\vec{v}|$: _____

4. Given points A(4,-5) and B(1,-3):
a) write $\overrightarrow{AB}$ in component form
b) calculate $|\overrightarrow{AB}|$
c) write as the sum of unit vectors

a) _____
b) _____
c) _____

5. Give an example of 2 vectors, < _____, _____ > and < _____, _____ > that are *not* perpendicular. Show why they are no

6. Given: $\vec{a} = \langle -3, 6 \rangle, \vec{b} = 5\vec{i} - 2\vec{j}, \vec{c} = \langle 2, 3 \rangle$, write $\vec{v} = 2\vec{b} - \vec{c} + 3\vec{a}$ as the sum of unit vectors.

6. _____

7. A ship leaves port and sails for 40 miles in a direction N55°E. Find the component form (ordered pair) of the distance the ship sails.

7. _____

8. Two hot air balloons take off at a spring festival. After about twenty minutes the path of the first balloon can be represented by $\langle 55, 81 \rangle$. If the path of the second balloon can be represented by $\langle 62, 77 \rangle$, find the angle between the vectors. Use: $\cos\theta = \frac{\vec{v} \cdot \vec{w}}{|\vec{v}|\,|\vec{w}|}$

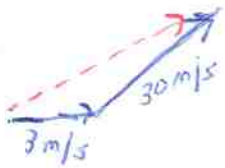
$\cos\theta = \frac{55(62)+81(77)}{\sqrt{55^2+81^2}\cdot\sqrt{62^2+77^2}}$ | $\cos\theta = \frac{9647}{\sqrt{9586}\cdot\sqrt{9773}}$ | $\theta = \cos^{-1}\left(\frac{9647}{\sqrt{9586}\cdot\sqrt{9773}}\right)$ | $\theta = 4.664°$

9. A batter on the opposing softball team hits a ground ball that rolls out to left field. The left fielder runs toward the ball at a velocity of 3 meters per second, scoops it, and proceeds to throw it to the catcher at a speed of 30 meters per second and at an angle of 25° with the horizontal in an effort to throw out the runner. What is the resultant speed and direction of the throw?

$\vec{v1} + \vec{v2} = \vec{r}$

$\vec{v1} = \langle 3, 0 \rangle$

$\vec{v2} = \langle 30\cos 25, 30\sin 25 \rangle$



$\vec{r} = \langle 30.189, 12.679 \rangle$

Speed $= \sqrt{30.189^2+12.679^2} = 32.743$ m/s

$\theta = \tan^{-1}\left(\frac{12.679}{30.189}\right) =$ Q1 $22.781°$

10. A corporate jet is flying at a bearing of 320° at 425 mph. If a 40 mph wind blows at a bearing of 290°, find the bearing and speed that the pilot must use to maintain the jet's former course.

$\vec{p} + \vec{w} = \vec{r}$

$\vec{p} = \vec{r} - \vec{w}$

* Entire problem in terms of bearing, so leave in bearing!

$\vec{r} = \langle 425\cos 320, 425\sin 320 \rangle$

$-\vec{w} = \langle 40\cos 290, 40\sin 290 \rangle$

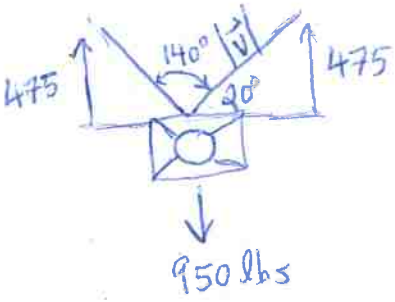
$\vec{p} = \langle 311.888, -235.597 \rangle$

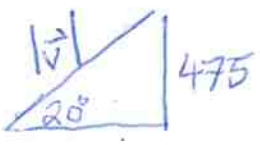
Speed $= |\vec{p}| \rightarrow \sqrt{311.888^2+235.597^2} = 390.871$ mph

direction: $\theta = \tan^{-1}\left(\frac{-235.597}{311.888}\right) = -37.067$ (Q4) $+360$

$\theta =$ bearing of $322.933°$

11. The lighting system for Milton theater is supported equally by two cables suspended from the ceiling of the auditorium. The cables form a 140° angle with each other. If the lighting system weighs 950 pounds, what is the force exerted by each of the cables on the lighting system?





$\sin\theta = \frac{o}{H}$

$\frac{\sin 20}{1} = \frac{475}{|\vec{v}|}$

$|\vec{v}|\sin 20 = 475$

$|\vec{v}| = \frac{475}{\sin 20}$

$|\vec{v}| = 1388.807$ lbs