Precalculus 6.1-6.2 Name: _____

Vectors and Their Applications

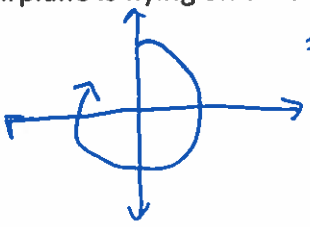
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find the component form of the indicated vector.

1) Let $u = \langle -1, 3 \rangle$, $v = \langle 6, -3 \rangle$. Find $-4u + 3v$. $\langle 4, -12 \rangle + \langle 18, -9 \rangle$ 1) $\langle 22, -21 \rangle$

Solve the problem.

2) An airplane is flying on a bearing of 280° at 430 mph. Find the component form 2) _____



$\theta = -190°$ or $170°$

$\langle 430\cos 170°, 430\sin 170° \rangle$

$\langle -423.467, 74.668 \rangle$

Find the magnitude and direction angle for the following vector. Give the direction angle as an angle in [0°, 360°) rounded to the nearest tenth.

3) $\langle -10, 3 \rangle$ $\langle -10, 3 \rangle$

$|v| = \sqrt{(-10)^2 + 3^2} = \sqrt{109}$

$\theta = \tan^{-1}\left(\frac{3}{-10}\right) =$ $-17 + 180$

3) 163°

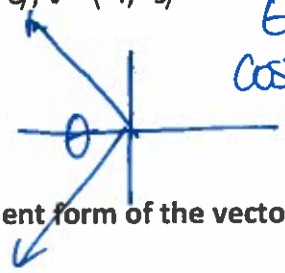
Find $a \cdot b$. Dot Product!

4) $a = \langle 5, -7 \rangle$, $b = \langle 3, -7 \rangle$ 4) 64

$a \cdot b = 5 \cdot 3 + (-7)(-7) = 15 + 49$

Find the angle between the given vectors to the nearest tenth of a degree.

5) $u = \langle -5, 8 \rangle$, $v = \langle -4, -9 \rangle$ 5) 124°



$\theta = \cos^{-1}\left(\frac{u \cdot v}{|u| \cdot |v|}\right)$

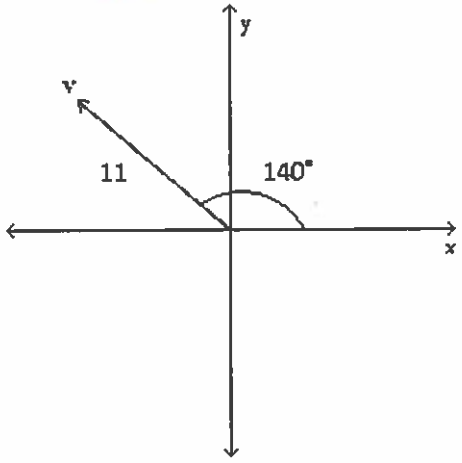
$u \cdot v = 20 - 72 = -52$

$|u| = \sqrt{89}$ $|v| = \sqrt{97}$

$\theta = \cos^{-1}\left(\frac{-52}{\sqrt{89} \cdot \sqrt{97}}\right)$

Find the component form of the vector v.

6) 6) _____

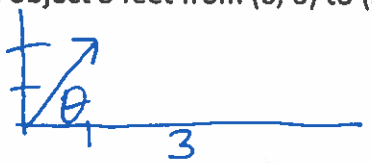


$\langle 11\cos 140, 11\sin 140 \rangle$

$\langle -8.426, 7.071 \rangle$

Solve the problem.

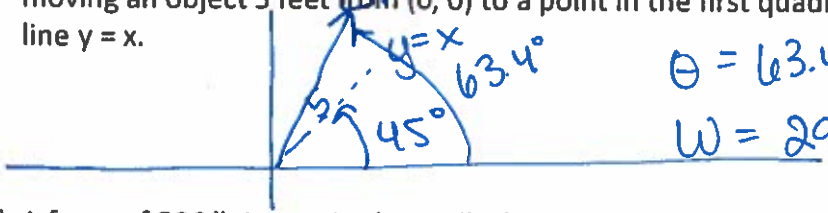
7) Find the work done by a force F of 27 pounds acting in the direction ⟨1, 2⟩ in moving an object 3 feet from (0, 0) to (3, 0). 7) 36 ft-lbs



$\theta = \tan^{-1}\left(\frac{2}{1}\right) = 63.4°$

$W = 27 \cdot \cos 63.4° \cdot 3$

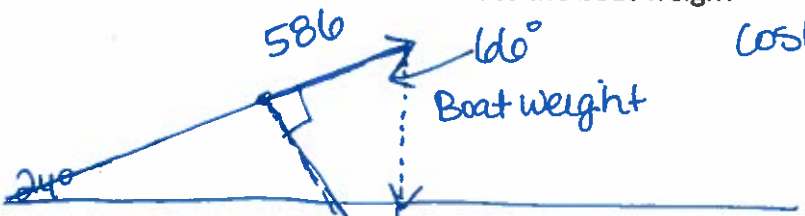
8) Find the work done by a force F of 29 pounds acting in the direction ⟨1, 2⟩ in moving an object 5 feet from (0, 0) to a point in the first quadrant along the line y = x. 8) 137 ft-lbs



$\theta = 63.4 - 45 = 18.4°$

$W = 29 \cdot \cos 18.4° \cdot 5$

9) A force of 586 lb is required to pull a boat up a ramp inclined at 24.0° with the horizontal. How much does the boat weigh? 9) _____



$\cos 66 = \frac{586}{B}$ $B = 1441$ lbs

10) An airplane flies on a compass heading of 90.0° at 390 mph. The wind affecting the plane is blowing from 324° at 35.0 mph. What is the true course and ground speed of the airplane? Round results to an appropriate number of significant digits. 10) 371 mph

Plane → $\theta = 0$ $\langle 390\cos 0, 390\sin 0 \rangle = \langle 390, 0 \rangle$

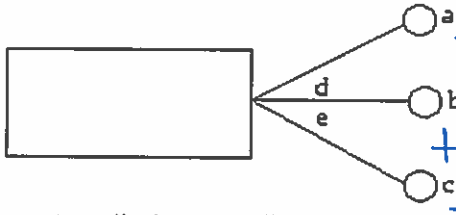
$\theta = \tan^{-1}\left(\frac{28.316}{369.428}\right)$

$\theta = 4°$

Wind → $\theta = -234°$ $\langle 35\cos -234, 35\sin -234 \rangle = \langle -20.572, 28.316 \rangle$

* sum of vectors = $\langle 369.428, 28.316 \rangle$ speed = $\sqrt{(369.428^2 + 28.316^2)} =$

11) Determine the resultant effect of three people pulling on a car as shown in the drawing. 11) _____



a = 95.0 lb, b = 45.0 lb, c = 41.0 lb, d = 18°, e = 19°

Round results to an appropriate number of significant digits.

$\langle 95\cos 18, 95\sin 18 \rangle$ +

$\langle 45\cos\theta, 45\sin\theta \rangle$ +

$\langle 41\cos -19°, 41\sin -19° \rangle$

$= \langle 174.117, 16 \rangle$

magnitude = $\sqrt{174.117^2 + 16^2}$

174.9 lbs

$\theta = \tan^{-1}\left(\frac{16}{174.117}\right)$

$= 5°$