Review 6.3-6.4 Precalculus w/ Trig Name_____
Period _____

1. Find the component form and magnitude of the vector **v** that has initial point $(-5,2)$ and terminal point $(3,-2)$. $3-5, -2-2$

component form $\langle 8,-4\rangle$ magnitude $\sqrt{8^2+4^2}=\sqrt{80}=4\sqrt{5}$

2. Let $\mathbf{v}=\langle -3,6\rangle$ and $\mathbf{w}=\langle 5,-4\rangle$, and find each of the following vectors.

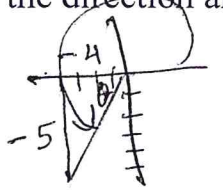
a) $3\mathbf{v}$ $3\langle -3,6\rangle$ $\langle -9,18\rangle$

b) $2\mathbf{w}-\mathbf{v}$ $\langle 10,-8\rangle-\langle -3,6\rangle$ $\langle 13,-14\rangle$

3. Find a unit vector in the direction of $\mathbf{v}=\langle 4,-5\rangle$. Write it in simplified radical form.

$\|v\|=\sqrt{4^2+5^2}=\sqrt{41}$ $\frac{4}{\sqrt{41}},\frac{-5}{\sqrt{41}}$ $\left\langle \frac{4\sqrt{41}}{41}, \frac{-5\sqrt{41}}{41}\right\rangle$

4. Find the direction angle of $\mathbf{v}=-4\mathbf{i}-5\mathbf{j}$ to the nearest thousandth of a degree.



$\tan^{-1}\left(\frac{5}{4}\right)=51.3402+180$ $\approx 231.340^\circ$

5. Find the vector **v** with $\|v\|=6$ and in the same direction as $\langle 3,6\rangle$. Write it in simplified radical form.

$\sqrt{3^2+6^2}=\sqrt{45}$ $6\left(\frac{3}{\sqrt{45}},\frac{6}{\sqrt{45}}\right)$ $\frac{18}{\sqrt{45}},\frac{36}{\sqrt{45}}$ $\left\langle \frac{6\sqrt{5}}{5}, \frac{12\sqrt{5}}{5}\right\rangle$

$\frac{6\cdot 18}{3\sqrt{5}}, \frac{12\cdot 3\sqrt{5}}{3\sqrt{5}}$

6. Find the component form of the vector that represents a ball thrown with an initial velocity of 120 feet per second, at an angle of 80° with the horizontal.

$120\langle \cos 80^\circ, \sin 80^\circ\rangle$ $\langle 120\cos 80^\circ, 120\sin 80^\circ\rangle$ stop here

$\langle 20.838, 118.177\rangle$

7. Use the vectors $\mathbf{u} = \langle -4,2 \rangle$, $\mathbf{v} = \langle 4,6 \rangle$, and $\mathbf{w} = \langle 1,-3 \rangle$ to find the indicated quantity. State whether the result is a vector or a scalar.

a) $\mathbf{u} \cdot \mathbf{v} =$ $-16+12 = -4$ Is it a vector or scalar?

b) $\mathbf{u} \cdot \mathbf{w} =$ $-4-6 = -10$ Is it a vector or scalar?

c) $\mathbf{v} \cdot \mathbf{w} =$ $4-18 = -14$ Is it a vector or scalar?

d) $3\mathbf{w} =$ $\langle 3,-9 \rangle$ Is it a vector or scalar?

8. a) Name two vectors that are orthogonal.

b) Name two vectors that are parallel.

$\langle 3,4 \rangle$ $\langle 4,-3 \rangle$

$\langle 3,4 \rangle$ $\langle 6,8 \rangle$

9. Find the angle to the nearest thousandth of a degree between vectors $\mathbf{u} = 3\mathbf{i} + 4\mathbf{j}$ and $\mathbf{v} = -4\mathbf{i} + 5\mathbf{j}$.

$\cos\theta = \dfrac{u \cdot v}{\|u\| \, \|v\|}$

$\langle 3,4 \rangle$ $\langle -4,5 \rangle$

$u \cdot v = -12 + 20 = 8$

$\|u\| = 5$ $\|v\| = \sqrt{41}$

$\cos\theta = \dfrac{8}{5\sqrt{41}}$

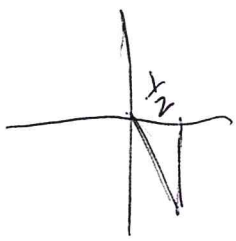
$\cos^{-1}\left(\dfrac{8}{5\sqrt{41}}\right) \approx 75.530^\circ$

10. Using the **unit circle**, find the exact value of $\mathbf{u} \cdot \mathbf{v}$, where θ is the angle between $\mathbf{u}$ and $\mathbf{v}$, if $\|u\| = 3$ and $\|v\| = 4$, $\theta = \dfrac{5\pi}{3}$.

$\cos\theta = \dfrac{u \cdot v}{\|u\| \, \|v\|}$

$\cos\dfrac{5\pi}{3}$

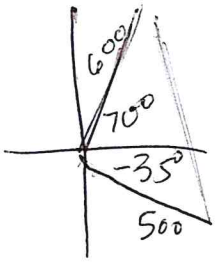
$\cos 300^\circ = \dfrac{u \cdot v}{3 \cdot 4}$



$12 \cos 300^\circ = 6$ $u \cdot v = 6$

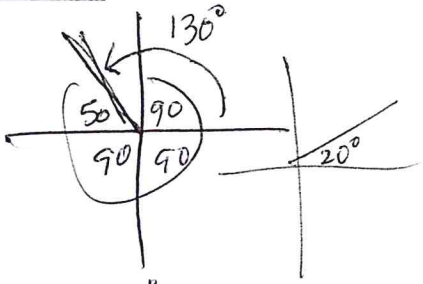
$12 \cdot \frac{1}{2} = 6$

11. Forces with magnitudes of 600 newtons and 500 newtons act on a machine part at angles of 70° and −35°, respectively, with the positive x-axis. Find the direction and magnitude of the resultant of these forces. Round both answers to the nearest thousandth.

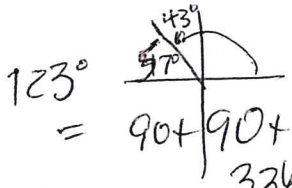


$600\langle \cos 70, \sin 70\rangle$
$+ 500\langle \cos -35, \sin -35\rangle$
$\langle 614.788108, 277.027343\rangle$ magnitude
$\tan^{-1}\left(\frac{y}{x}\right) = 24.257°$ direction 674.321 newtons

12. An airplane is traveling at a speed of 400 miles per hour with a bearing of 320° at a fixed altitude with a negligible wind velocity. As the airplane reaches a certain point, it encounters a wind blowing with a velocity of 50 miles per hour in the direction of N70°E. What are the resultant speed and direction of the airplane? Round both answers to the nearest thousandth.

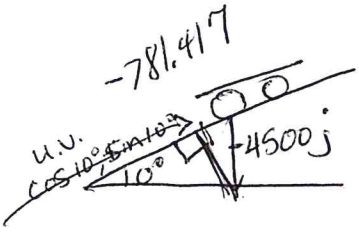


$320° = 130°$ trig
$N70°E = 20°$ trig
$400\langle \cos 130°, \sin 130°\rangle$
$+ 50\langle \cos 20°, \sin 20°\rangle$
$\langle -210.1304128, 323.5187844\rangle$
$\tan^{-1}\left(\frac{y}{x}\right) = -57.000 + 180 \approx 123.000°$
385.771 mph



123°
$= 90 + 90 + 90 + 57 =$
326.996° bearing

13. A sport utility vehicle with a gross weight of 4500 pounds is parked on a slope of 10°. Assume that the only force to overcome is the force of gravity. Find the force required to keep the vehicle from rolling down the hill then find the force perpendicular to the hill. Round both answers to the nearest thousandth of a pound.



$\langle \cos 10°, \sin 10°\rangle \langle 0, -4500\rangle$ $\langle u \cdot v\rangle v$ magnitude
$\sin 10° \cdot -4500$
≈ 781.417 lbs.
$\sqrt{4500^2 - 781.417^2} \approx 4431.635$ lbs.

14. A force of 30 pounds in the direction of 20° above the horizontal is required to slide a table across a floor. Find the work done to the nearest thousandth of a foot-pound if the table is pushed 24 feet.

$\cos 20° \cdot 30 \cdot 24$
30
$720 \cdot \cos 20° \approx 676.579$ ft lbs