**Homework Set #4.1** Name

*All answers must be placed on the answer sheet.*

*Work should be done on a separate sheet of paper and then be stapled to the answer sheet.*

**For #1-3, find the component form of AB. Then, find the magnitude of AB.**

$<x\_{2}-x\_{1},y\_{2}-y\_{1}>$ **;**$magnitude of<u\_{1},u\_{2}> = u\_{1}^{2}+u\_{2}^{2}$

1. $A (2,4)$, $B (-1,3)$ 2. $A (4,-2)$, $B (5,-5)$ 3. $A (-3,-6)$, $B (8,-1)$

 <-3, -1> <1, -3> <11,5>

 $magnitude: \sqrt{10}$ $magnitude: \sqrt{10}$ $magnitude: \sqrt{146}$

**For #4-6, let** $v=<2, -1>$ **and** $w=<-3, 5>$**. Find** $u$**.**

4. $u=v+w$ 5. $u=v-w$ 6. $u=5w-2v$

 <-1, 4> <5, -6> <-19, 27>

**For #7-8, find the component form of each vector. Draw and label a reference triangle**

7. $\left| \right| u | |=20$, angle $=150°$ Q2 8. $\left| \right| u | |=10$, angle $=135°$ Q2

 $\cos(30°=\frac{x}{20},\sin(30°)=\frac{y}{20})$ $\cos(45°=\frac{x}{10},\sin(45°=\frac{y}{10}))$

 $<-10\sqrt{3}, 10>$ $<-5\sqrt{2}, 5\sqrt{2}$>

**Find** $k$ **so that** $u$ **and** $v$ **are orthogonal. Dot product equals 0.**

$Dot product;If \vec{u}=<u\_{1},u\_{2}>and \vec{v}=<$$v\_{1},v\_{2}>then \vec{u}⋅\vec{v}=u\_{1}v\_{1}+u\_{2}v\_{2}$

9a. $u=3i+2j$ 9b. $u=-3ki+5j$

 $v=2i-kj$ $v=2i-4j$

 $u=<3,2>, v=<2,-k>$ $u=<-3k,5>, v=<2,-4>$

 $\vec{u}⋅\vec{v}=6-2k$ $\vec{u}⋅\vec{v}=-6k-20$

$so 6-2k=0 (to be orthogonal)$$so-6k-20=0$

$k=3$$k=-\frac{10}{3}$

10. A plane is headed due south with an airspeed of 192 mph. A wind with a bearing of 78 degrees is blowing

 at 23 mph. Find the groundspeed and resulting bearing of the plane.

Set up a plane vector and a wind vector. Because the plane is flying due south the bearing is$180°$. We cannot create a reference triangle for that, but all reference triangles we have drawn have let us to the fact that $x=rcos θ and y=rsin θ.$ So for the plane

$x=192\cos(-90°, y=192\sin(-90°))$ (the -90 is the standard position angle for the bearing.

 So $plane=<0,-192>$

 $wind: x=23\cos(12°), y=23\sin(12°) remember 12 is the standard angle$

 $wind= <22.497, 4.782>$

$$groundspeed=plane+wind: <0, -192>+<22.497, 4.782>=<22.497, -187.218>$$

These are components, we need magnitude and direction, so draw a reference triangle.

$$r^{2}=22.497^{2}+(-187.218)^{2} so r≈188.564$$

$$direction; θ=tan^{-1}\frac{y}{x} so θ=tan^{-1}\frac{-187.218}{22.497}$$

$$θ≈-83.148°$$

Remember, direction is bearing so ignore the negative on the angle and add 90 to get back to North since it’s a bearing. Direction= $83.148°+90°=173.148°$

11. Eliminate the parameter: $x=2\sin(θ)$, $y=4\cos(θ)$

So we solve for cosine and sine

Remember, we cannot use inverses here:

$$\frac{x}{2}=\sin(θ, \frac{y}{4}=\cos(θ))$$

Then we use the Pythagorean Identity: $sin^{2}θ+cos^{2}θ=1$

$$so,\frac{x}{4}^{2}+\frac{y}{16}^{2}=1$$

Standard form: Set the equation =0. NO FRACTIONS

$$4x^{2}+y^{2}=16$$

**Homework Set #4.1** Name

*ANSWER SHEET*

1. Component Form
2. Component Form

1. Component Form
2. U =
3. U =

1. U =
2.
3.
4. a.
5. Groundspeed\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Bearing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_