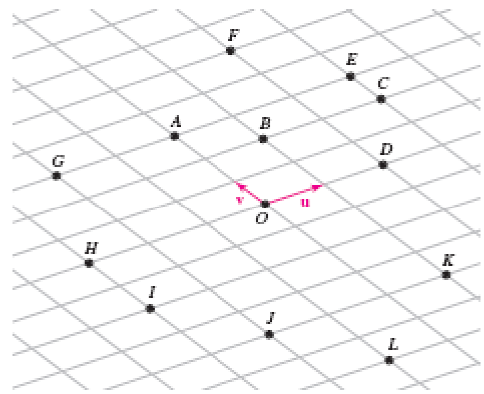
Student: Phong Vo **Date:** 02/06/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 12.1 Homework

1. If a force has magnitude 112 and is directed 60° south of east, what are its components?

The force vector has components, F_x = 56 and F_y = $-56\sqrt{3}$.
(Type an exact answer, using radicals as needed.)

2. Refer the figure to the right and carry out the following vector operation.

Write the following vector as a sum of scalar multiples of **u** and **v**.



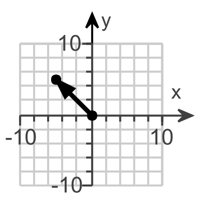
$\overrightarrow{OB}$ = u + 2v

3. Define the points P(0,0) and Q(5, − 5). For the vector $\overrightarrow{PQ}$, do the following.

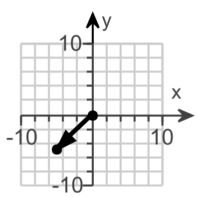
a. Sketch the vector in an xy-coordinate system.
b. Compute the magnitude of the vector.

a. Graph the vector $\overrightarrow{PQ}$. Choose the correct graph below.

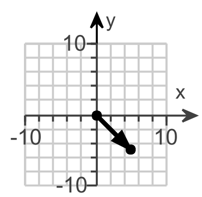
A.



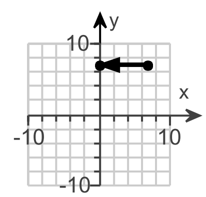
B.



C. ✔



D.



b. $\left|\overrightarrow{PQ}\right|$ = $5\sqrt{2}$
(Type an exact answer, using radicals as needed.)

4. Let **u** = $\langle 6, -2 \rangle$ and **v** = $\langle -2, -5 \rangle$. Express **u** + **v** in the form $\langle a,b \rangle$.

u + **v** = $\langle$ 4 , − 7 $\rangle$
(Simplify your answers.)

5. Let **u** = $\langle 9,3 \rangle$ and **v** = $\langle 8,5 \rangle$. Express 7**u** + 2**v** in the form $\langle a,b \rangle$.

7**u** + 2**v** = $\langle$ 79 , 31 $\rangle$
(Simplify your answers.)

6. Find two vectors parallel to **v** with three times the magnitude of **v**.

$\mathbf{v} = \langle 5,0 \rangle$

Select the correct two vectors below.

- [ ] **A.** $\left\langle \frac{-5}{5}, \frac{0}{5} \right\rangle$
- [x] **B.** $\langle 15,0 \rangle$
- [ ] **C.** $\left\langle \frac{5}{5}, \frac{0}{5} \right\rangle$
- [ ] **D.** $\langle -5,0 \rangle$
- [ ] **E.** $\langle 0,-15 \rangle$
- [x] **F.** $\langle -15,0 \rangle$

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7. Define the points $P(-4,3)$ and $Q(-6,6)$. Carry out the following calculation.

Express $\overrightarrow{PQ}$ in the form $a\mathbf{i} + b\mathbf{j}$.

$\overrightarrow{PQ} = (-2)\mathbf{i} + (3)\mathbf{j}$

(Simplify your answers.)

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8. Define the points $Q(2,-1)$ and $R(9,23)$. Carry out the following calculation.

Find the unit vector with the same direction as $\overrightarrow{QR}$.

$\left\langle \frac{7}{25}, \frac{24}{25} \right\rangle$

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9. Complete parts **(a)** through **(c)** below.

a. Find two unit vectors parallel to $\mathbf{v} = 5\mathbf{i} + 12\mathbf{j}$.

b. Find b if $\mathbf{v} = \left\langle \frac{1}{3}, b \right\rangle$ is a unit vector.

c. Find all values of a such that $\mathbf{w} = a\mathbf{i} + \frac{a}{8}\mathbf{j}$ is a unit vector.

a. The parallel unit vector with the same direction is $\left\langle \frac{5}{13}, \frac{12}{13} \right\rangle$.

The parallel unit vector with the opposite direction is $\left\langle -\frac{5}{13}, -\frac{12}{13} \right\rangle$.

b. $b = \frac{2\sqrt{2}}{3}, \frac{-2\sqrt{2}}{3}$.

(Type exact answers, using radicals as needed. Use a comma to separate answers as needed.)

c. $a = \frac{8}{\sqrt{65}}, -\frac{8}{\sqrt{65}}$

(Type exact answers, using radicals as needed. Use a comma to separate answers as needed.)

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10. Use the properties of vectors to solve the following equation for the unknown vector $\mathbf{x} = \langle a,b \rangle$. Let $\mathbf{u} = \langle 2,-4 \rangle$ and $\mathbf{v} = \langle 5,1 \rangle$.

$$2\mathbf{x} - 8\mathbf{u} = \mathbf{v}$$

$\mathbf{x} = \left\langle \frac{21}{2}, -\frac{31}{2} \right\rangle$

(Simplify your answers.)

11. A sum of scalar multiples of two vectors (such as $a\mathbf{u} + b\mathbf{v}$, where a and b are scalars) is called a linear combination of the vectors.

Let $\mathbf{u} = \langle 3,3 \rangle$ and $\mathbf{v} = \langle -3,3 \rangle$. Express $\langle -15,3 \rangle$ as a linear combination of $\mathbf{u}$ and $\mathbf{v}$.

$\langle -15,3 \rangle = -2\,\mathbf{u} + 3\,\mathbf{v}$