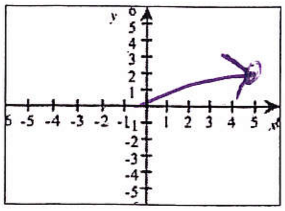
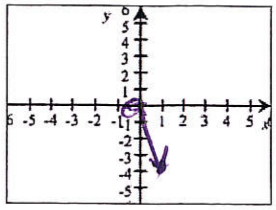
Unit 11 – Additional Topics in Trigonometry - Homework

1. Write and draw the vector whose initial point is the origin and whose terminal point is:

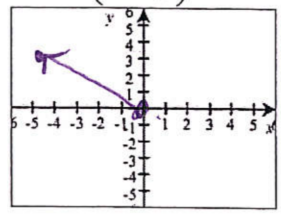
a. $(5,2)$



b. $(1,-4)$

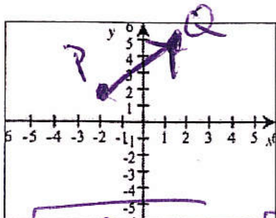


c. $\left(\frac{-9}{2},\frac{7}{2}\right)$



2) Find and draw the vector **v** with initial point P and terminal point Q. Also find the magnitude of **v.**

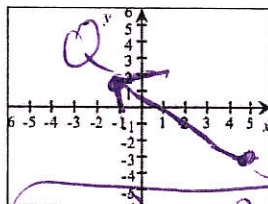
a. $P(-2,2),Q(2,5)$



P Q

$\sqrt{4^2+3^2}$ $\sqrt{25}=5$

b. $P(5,-3),Q(-1,1)$



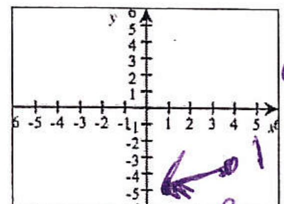
Q P

$\sqrt{40}$

$2\sqrt{10}$

$\sqrt{(-6)^2+4^2}$

c. $P(4,-4),Q(1,-5)$



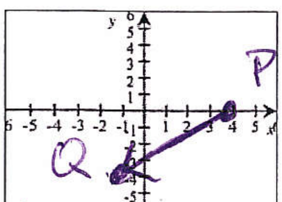
$9+1$

1

$\sqrt{10}$

Q P

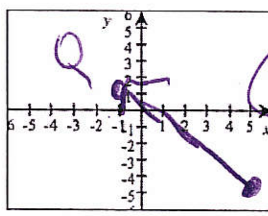
d. $P(4,0),Q(-1,-4)$



P Q

$\sqrt{25+16}$ $\sqrt{41}$

e. $P(5,-5),Q(-1,1)$

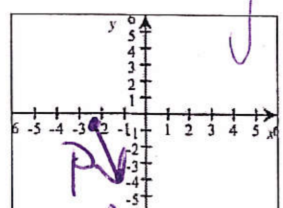


Q P

$6\sqrt{2}$

$\sqrt{36+36}$

f. $P(-2.5,-0.5),Q(-1.5,-3.5)$



$\sqrt{1^2+9}$

$\sqrt{10}$

P Q

3. Determine if the vector **v** with initial point (p_1,p_2) and terminal point (q_1,q_2) is equivalent to vector **w** with initial point (r_1,r_2) and terminal point (s_1,s_2)

a. **v** $(4,2),(-3,1)$
w$(5,-3),(-2,-4)$

$\|v\| = \sqrt{49+1}$ $\sqrt{50}$

$\|w\|$ $\sqrt{49+1} = \sqrt{50}$

$\langle -7,-1\rangle$ $\langle -7,-1\rangle$

yes

b. **v** $(-1,6),(-4,4)$
w$(2,-7),(4,-4)$

$\langle -3,-2\rangle$ $\langle 2,3\rangle$

no

c. **v** $(-7,0),(2,-9)$
w$(5,-3),(-4,6)$

$\langle 9,-9\rangle$

$\langle -9,9\rangle$

no

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4. Given the vectors $\mathbf{u}=\langle -3,8\rangle, \mathbf{v}=\langle 6,-2\rangle, \mathbf{w}=\left\langle \frac{1}{2},\frac{-2}{3}\right\rangle$, find the following:

a) $\mathbf{u}+\mathbf{v}$ b) $\mathbf{u}-\mathbf{v}$ c) $3\mathbf{u}$ d) $3\mathbf{u}-4\mathbf{v}$

$\langle 3,6\rangle$ $\langle -9,10\rangle$ $\langle -9,24\rangle$ $\langle -9,24\rangle+\langle -24,8\rangle$

$\langle -33,32\rangle$

e) $6\mathbf{w}-\frac{1}{2}\mathbf{v}+\mathbf{u}$ f) $\|2\mathbf{u}+\mathbf{v}\|$ g) $\frac{\mathbf{v}}{\|\mathbf{v}\|}$ $\sqrt{36+4}$ $\sqrt{40}$ h) $\frac{\mathbf{u}+\mathbf{v}}{\|\mathbf{u}+\mathbf{v}\|}$

$\langle 3,-6\rangle+\langle -3,1\rangle+\langle -3,8\rangle$

$\langle -3,3\rangle$

$\langle -6,16\rangle+\langle 6,-2\rangle$

$\langle 0,14\rangle$ $\boxed{14}$

5. Find a unit vector in the direction of the following vectors and show that it has length 1.

a. $\mathbf{v}=\langle 5,12\rangle$ b. $\mathbf{v}=\langle 0,-2\rangle$ c. $\mathbf{v}=\langle -3,-3\rangle$

$\left\langle \frac{5}{13},\frac{12}{13}\right\rangle$ $\langle 0,-1\rangle$ ✓ $\left\langle \frac{-3}{3\sqrt{2}},\frac{-3}{3\sqrt{2}}\right\rangle$ or $\left\langle \frac{-1}{\sqrt{2}},\frac{-1}{\sqrt{2}}\right\rangle$

$\sqrt{\frac{25}{169}+\frac{144}{169}}=\sqrt{\frac{169}{169}}$ $\left\langle -\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2}\right\rangle$ $\sqrt{\frac{2}{4}+\frac{2}{4}}$ $\sqrt{\frac{4}{4}}$

d. $\mathbf{v}=\langle 5,10\rangle$ $\sqrt{125}$ $5\sqrt{5}$ e. $\mathbf{v}=\langle -\sqrt{10},-\sqrt{6}\rangle$ $\sqrt{10+6}=4$ f. $\mathbf{v}=\langle 6\sqrt{2},\frac{1}{2}\rangle$ $\sqrt{72+\frac{1}{4}}$

$\left\langle \frac{\sqrt{5}}{5},\frac{2\sqrt{5}}{5}\right\rangle$ $\left\langle \frac{-\sqrt{10}}{4},\frac{-\sqrt{6}}{4}\right\rangle$ $\boxed{\left\langle \frac{12\sqrt{2}}{17},\frac{1}{17}\right\rangle}$ $\sqrt{\frac{289}{4}}$ $\frac{17}{2}$

$\sqrt{\frac{5}{25}+\frac{20}{25}}=\sqrt{\frac{25}{25}}$ $\sqrt{\frac{10}{16}+\frac{6}{16}}$ ✓

6. Let $\mathbf{u}$ be the vector with initial point (2, -5) and terminal point (-4, 1) and let $\mathbf{v} = -8\mathbf{i} - 6\mathbf{j}$. Write the following as a linear combination of $\mathbf{i}$ and $\mathbf{j}$.

a) $\mathbf{u}$ b) $-2\mathbf{v}$ c. $3\mathbf{u} - 4\mathbf{v}$

$\frac{288}{289}+\frac{1}{289}$

d. $\mathbf{u}-\mathbf{v}$ e. $\frac{1}{3}(\mathbf{u}-\mathbf{v})$ f. $\frac{\mathbf{u}-\mathbf{v}}{\|\mathbf{u}-\mathbf{v}\|}$

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