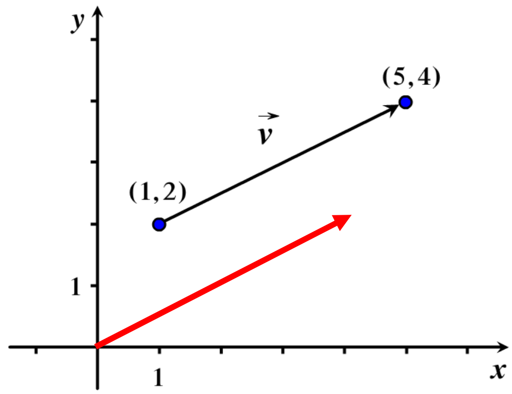
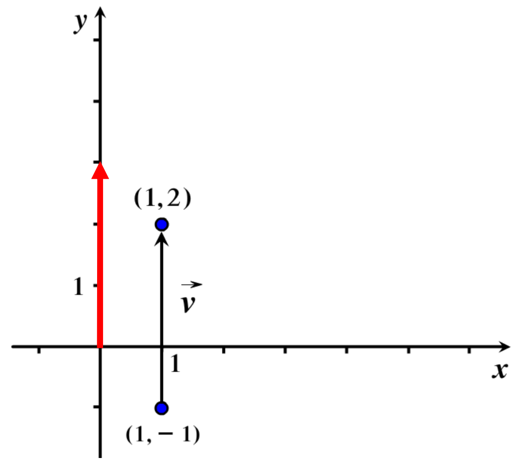
1) Find the component form of the vector $\vec{v}$ and sketch the vector with its initial point at the origin.



$\boxed{\vec{v} = \langle 4,2 \rangle}$



$\boxed{\vec{v} = \langle 0,3 \rangle}$

2) Find the component form of the vectors $\vec{u}$ and $\vec{v}$ whose initial and terminal points are given. Show that $\vec{u}$ and $\vec{v}$ are equivalent.

$\vec{u}$: $(3,2)$, $(5,6)$ $\boxed{\vec{u} = \langle 2,4 \rangle}$

$\vec{v}$: $(1,4)$, $(3,8)$ $\boxed{\vec{v} = \langle 2,4 \rangle}$

3) The initial and terminal points of vector $\vec{v}$ are $(4,-6)$ and $(3,6)$ respectively. Write the vector as the linear combination of the standard unit vectors $\mathbf{i}$ and $\mathbf{j}$.

$$\boxed{\vec{v} = -\mathbf{i} + 12\mathbf{j}}$$

4) Find each scalar multiple of $\vec{v} = \langle -2,3 \rangle$.

a) $2\vec{v}$ $\boxed{\langle -4,6 \rangle}$ b) $-3\vec{v}$ $\boxed{\langle 6,-9 \rangle}$ c) $0\vec{v}$ $\boxed{\langle 0,0 \rangle}$ d) $-\frac{1}{2}\vec{v}$ $\boxed{\left\langle 1,-\frac{3}{2} \right\rangle}$

5) Find the vector $\vec{v}$ where $\vec{u} = \langle 2,-1 \rangle$ and $\vec{w} = \langle 1,2 \rangle$.

a) $\vec{v} = \frac{3}{2}\vec{u}$ $\boxed{\left\langle 3,-\frac{3}{2} \right\rangle}$ b) $\vec{v} = \vec{u} + \vec{w}$ $\boxed{\langle 3,1 \rangle}$ c) $\vec{v} = \vec{u} + 2\vec{w}$ $\boxed{\langle 4,3 \rangle}$ d) $\vec{v} = 5\vec{u} - 3\vec{w}$ $\boxed{\langle 7,-11 \rangle}$

6) The vector $\vec{v} = \langle -1,3 \rangle$ and its initial point is $(4,2)$, find the terminal point.

$\boxed{(3,5)}$

7) Find the magnitude of $\vec{v}$:

a) $\vec{v} = 7\mathbf{i}$ $\boxed{7}$ b) $\vec{v} = \langle 12,-5 \rangle$ $\boxed{13}$ c) $\vec{v} = -10\mathbf{i} + 3\mathbf{j}$ $\boxed{\sqrt{109}}$

8) Find the unit vector in the direction of $\vec{v}$ and verify that it has a length of 1.

a) $\vec{v} = \langle 3,12 \rangle$ $\boxed{\left\langle \frac{\sqrt{17}}{17},\frac{4\sqrt{17}}{17} \right\rangle}$ b) $\vec{v} = \left\langle \frac{3}{2},\frac{5}{2} \right\rangle$ $\boxed{\left\langle \frac{3\sqrt{34}}{34},\frac{5\sqrt{34}}{34} \right\rangle}$

9) Given that $\vec{u}=\langle 1,-1\rangle$ and $\vec{v}=\langle -1,2\rangle$ find the following:

a) $\left\|\vec{u}+\vec{v}\right\|$ $\boxed{1}$

b) $\left\|\dfrac{\vec{u}+\vec{v}}{\left\|\vec{u}+\vec{v}\right\|}\right\|$ $\boxed{1}$

10) Find $\vec{u}+\vec{v}$. Then demonstrate the triangle inequality using the vectors $\vec{u}=\langle 2,1\rangle$ and $\vec{v}=\langle 5,4\rangle$.

$$\boxed{\vec{u}+\vec{v}=\langle 7,5\rangle \quad \sqrt{74}\le\sqrt{5}+\sqrt{41}}$$

11) Find vector $\vec{v}$ with a magnitude of 2 and the same direction as $\vec{u}=\left\langle \sqrt{3},3\right\rangle$

$$\boxed{\vec{v}=\left\langle 1,\sqrt{3}\right\rangle}$$

12) Find the component form of $\vec{v}$ given that its magnitude is equal to 2 and the angle it makes with the positive $x-axis$ is $\theta=150°$.

$$\boxed{\vec{v}=\left\langle -\sqrt{3},1\right\rangle}$$

13) Find the component form of $\vec{u}+\vec{v}$ given that $\left\|\vec{u}\right\|=1$, $\left\|\vec{v}\right\|=3$ and the angles that $\vec{u}$ and $\vec{v}$ make with the positive $x-axis$ is $\theta_u=0°$ and $\theta_v=45°$.

$$\boxed{\left\langle \frac{2+3\sqrt{2}}{2},\frac{3\sqrt{2}}{2}\right\rangle}$$

14) Find a and b such that $\vec{v} = a\vec{u} + b\vec{w}$, where $\vec{u} = \langle 1,2 \rangle$, $\vec{w} = \langle 1,-1 \rangle$ and $\vec{v} = \langle 2,1 \rangle$

$$\boxed{a = 1,\ b = 1}$$

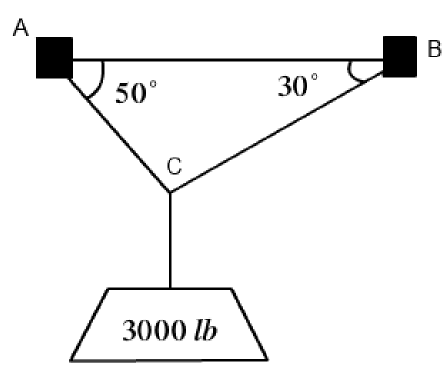
15) Find a unit vector parallel to and perpendicular to the graph $f(x) = x^2$ at the point $(3,9)$.

$$Parallel = \pm\frac{1}{\sqrt{37}}\langle 1,6 \rangle$$
$$Perpendicular = \pm\frac{1}{\sqrt{37}}\langle -6,1 \rangle$$

16) Three forces with magnitudes of 75 pounds, 100 pounds, and 125 pounds act on an object at angles of $30°$, $45°$, and $120°$, respectively, with the positive $x-axis$. Find the direction and magnitude of the resultant force.

$$\left\|\vec{R}\right\| \approx 385.248\ \ newtons$$
$$\theta_R \approx 39.6°$$

17) Use the figure below to determine the tension in each cable supporting the given load.



$$\left\|\overrightarrow{CB}\right\| \approx 1958.1\ \ pounds$$
$$\left\|\overrightarrow{CA}\right\| \approx 2638.2\ \ pounds$$