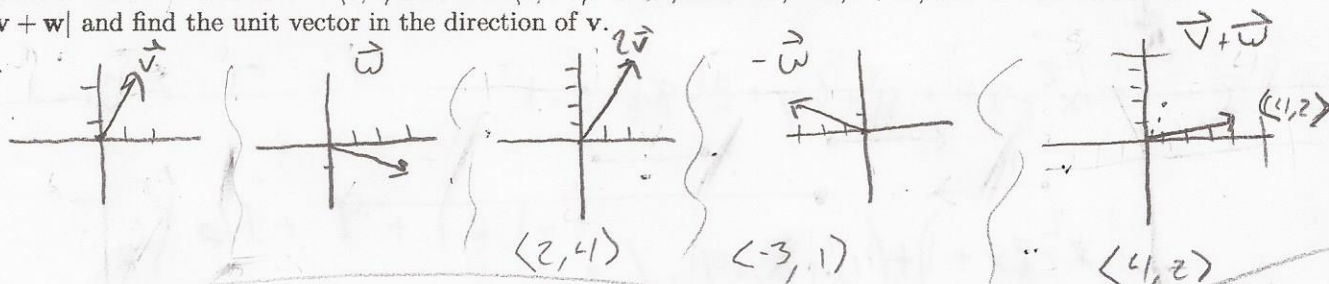
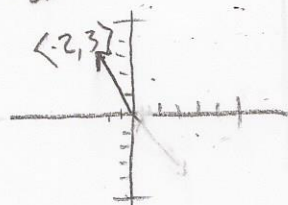


Exercise 1. Plot the vectors $\mathbf{v} = \langle 1, 2 \rangle$ and $\mathbf{w} = \langle 3, -1 \rangle$. Then, draw $2\mathbf{v}$, $-\mathbf{w}$, $\mathbf{v} + \mathbf{w}$, and $\mathbf{v} - \mathbf{w}$. Calculate also $|\mathbf{v} + \mathbf{w}|$ and find the unit vector in the direction of \mathbf{v} .

 $\mathbf{v} - \mathbf{w}$ 

$$|\mathbf{v} + \mathbf{w}|$$

$$\sqrt{1^2 + 2^2} + \sqrt{3^2 + (-1)^2}$$

$$\sqrt{5} + \sqrt{10}$$

$$\frac{\sqrt{5} + \sqrt{10}}{2}$$

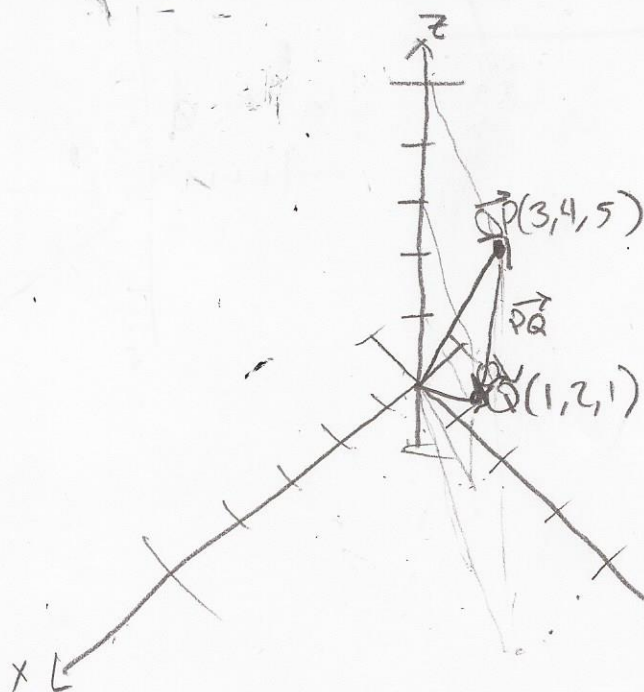
$$y = 2x \quad \hat{\mathbf{v}} = \left\langle \frac{1}{3}, \frac{2}{3} \right\rangle$$

$$1 = \sqrt{2x^2 + x^2}$$

$$1 = \sqrt{3x^2} \quad x = \frac{1}{3}$$

$$1 = 3x$$

Exercise 2. Plot the points $P(3, 4, 5)$ and $Q(1, 2, 1)$. Then, plot the vectors $\vec{OP} = \langle 3, 4, 5 \rangle$, $\vec{OQ} = \langle 1, 2, 1 \rangle$, and \vec{PQ} and calculate the magnitude $|\vec{PQ}|$ and find the midpoint of the segment \overline{PQ} .



$$\vec{PQ} = \langle 3-1, 4-2, 5-1 \rangle$$

$$\vec{PQ} = \langle 2, 2, 4 \rangle$$

$$|\vec{PQ}| = \sqrt{2^2 + 2^2 + 4^2}$$

$$4 + 4 + 16$$

$$\sqrt{24}$$

$$|\vec{PQ}| = 2\sqrt{6}$$

Midpoint $\vec{PQ} = M$

$$M = \left\langle \frac{3+1}{2}, \frac{4+2}{2}, \frac{5+1}{2} \right\rangle$$

$$M = \langle 2, 3, 3 \rangle$$

Exercise 3. Determine the center and radius of the sphere given by

$$x^2 + y^2 + z^2 - 2x + 6y - 8z = -1.$$

$$x^2 - 2x + y^2 + 6y + z^2 - 8z = -1$$

$$(x^2 - 2x + 1) + (y^2 + 6y + 9) + (z^2 - 8z + 16) = (-1 + 1 + 9 + 16)$$

$$(x-1)^2 + (y+3)^2 + (z-4)^2 = 25$$

Center is $C = (1, -3, 4)$

$$\text{Radius} = \sqrt{25} = 5$$