Precalculus

11-02 Vectors in space

Vectors in 3-D

$$\vec{v} = \langle v_1, v_2, v_3 \rangle$$

- To find a vector from the _____point (p_1, p_2, p_3) to the _____point (q_1, q_2, q_3)

$$\vec{v} = \langle q_1 - p_1, q_2 - p_2, q_3 - p_3 \rangle$$

If $\vec{v} = \langle v_1, v_2, v_3 \rangle$ and $\vec{u} = \langle u_1, u_2, u_3 \rangle$,

- Addition
  - Add corresponding _____

$$\vec{v} + \vec{u} = \langle v_1 + u_1, v_2 + u_2, v_3 + u_3 \rangle$$

- Scalar multiplication
  - _____

$$c\vec{v} = \langle cv_1, cv_2, cv_3 \rangle$$

- Dot Product

$$\vec{v} \cdot \vec{u} = v_1u_1 + v_2u_2 + v_3u_3$$

- Magnitude

$$\|\vec{v}\| = \sqrt{v_1^2 + v_2^2 + v_3^2}$$

- Unit vector in the direction of $\vec{v}$

$$\frac{\vec{v}}{\|\vec{v}\|}$$

- Angle between vectors

$$\vec{u} \cdot \vec{v} = \|\vec{u}\|\|\vec{v}\| \cos\theta$$

- If $\theta = 90°$ (and $\vec{u} \cdot \vec{v}$ =_____), then vectors are _____
- If $\vec{u} = c\vec{v}$, then vectors are _____

Let $\vec{m} = \langle 1,\ 0,\ 3 \rangle$ and $\vec{n} = \langle -2,\ 1,\ -4 \rangle$

Find $\|\vec{m}\|$

Find unit vector in direction of $\vec{m}$

Find $\vec{m} + 2\vec{n}$

Find $\vec{m} \cdot \vec{n}$

Find the angle between $\vec{m}$ and $\vec{n}$

Are $\vec{p} = \langle 1,\ 5,\ -2 \rangle$ and $\vec{q} = \left\langle -\frac{1}{5},\ -1, \frac{2}{5} \right\rangle$ parallel, orthogonal, or neither?

Are $P(1,\ -1,\ 3)$, $Q(0,\ 4,\ -2)$, and $R(6,\ 13,\ -5)$ collinear?