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MAC 2313.3118
Cyr

Quiz 1

You must show all work to receive full credit!!

Problem 1. (4 pts) Let $\vec{v} = \langle -5, 8, 3 \rangle$.

(a) Find the unit vector \vec{u} which points in the same direction as \vec{v} .

$$\|\vec{v}\| = \sqrt{(-5)^2 + 8^2 + 3^2} = \sqrt{25 + 64 + 9} = \sqrt{98}$$

$$\vec{u} = \frac{1}{\sqrt{98}} \vec{v} = \left\langle \frac{-5}{\sqrt{98}}, \frac{8}{\sqrt{98}}, \frac{3}{\sqrt{98}} \right\rangle$$

(b) Write the vector equation of the line passing through $(2, -3, 6)$ with direction vector \vec{v} .

$$\vec{r}(t) = \langle x_0, y_0, z_0 \rangle + t \langle a, b, c \rangle$$

$$= \langle 2, -3, 6 \rangle + t \langle -5, 8, 3 \rangle$$

$$= \langle 2 - 5t, -3 + 8t, 6 + 3t \rangle$$

Problem 2. (6 pts) Let $\vec{u} = \langle -1, 2, -2 \rangle$ and $\vec{v} = \langle 3, -4, 0 \rangle$.

(a) Determine whether \vec{u} and \vec{v} are orthogonal.

$$\vec{u} \cdot \vec{v} = (-1 \cdot 3) + (2 \cdot -4) + (-2 \cdot 0)$$

$$= -3 - 8 = -11 \neq 0$$

Thus, \vec{u} and \vec{v} are not orthogonal.

(b) Find the cosine of the angle between \vec{u} and \vec{v} .

$$\cos \theta = \frac{\vec{u} \cdot \vec{v}}{\|\vec{u}\| \|\vec{v}\|} = \frac{-11}{3 \cdot 5} = \frac{-11}{15}$$

$$\|\vec{u}\| = \sqrt{(-1)^2 + 2^2 + (-2)^2} = \sqrt{1 + 4 + 4} = \sqrt{9} = 3$$

$$\|\vec{v}\| = \sqrt{3^2 + (-4)^2 + 0^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$