

Question #53926– Math – Calculus

Determine whether the vectors u and v are parallel, orthogonal, or neither.

$$\vec{u} = \langle 7, 2 \rangle, \vec{v} = \langle 21, 6 \rangle$$

Solution:

$$\vec{u} = 7i + 2j$$

$$\vec{v} = 21i + 6j$$

The dot product two vectors:

$$\vec{u} \cdot \vec{v} = u_x \cdot v_x + u_y \cdot v_y$$

And

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

θ is the angle between \vec{u} and \vec{v}

Two vectors are orthogonal then we know that the angle between them is 90° ($\cos \theta = 0$), and so

$$\vec{u} \cdot \vec{v} = 0$$

$$u_x = 7, u_y = 2$$

$$v_x = 21, v_y = 6$$

$$\vec{u} \cdot \vec{v} = 7 \cdot 21 + 2 \cdot 6 = 159 \neq 0$$

So, they aren't orthogonal.

$$\|\vec{u}\| = \sqrt{7^2 + 2^2} = \sqrt{53}$$

$$\|\vec{v}\| = \sqrt{21^2 + 6^2} = \sqrt{477}$$

$$\|\vec{u}\| \cdot \|\vec{v}\| = \sqrt{53} \cdot \sqrt{477} = \sqrt{25281} = 159$$

$$159 \cdot \cos \theta = 159$$

$$\cos \theta = 1$$

$$\theta = 0$$

So, the two vectors are parallel.

Answer:

The two vectors are parallel.