

Math 4133 - Linear Algebra

Quiz #8 - 2014.02.21

Solutions

Consider the following vectors:

$$\vec{t} = \langle 1, 0, -1 \rangle, \quad \vec{u} = \langle 1, 2, -1 \rangle, \quad \vec{v} = \langle 1, 0, 1 \rangle, \quad \vec{w} = \langle -2, -4, 2 \rangle,$$

1. Which of the vectors has the largest magnitude?

The vector \vec{w} has the largest magnitude, with $|\vec{w}| = \sqrt{2^2 + 4^2 + 2^2} = \sqrt{24}$.

2. Two of the vectors lie along the same line, which are they?

The vectors \vec{u} and \vec{w} lie along the same line since $\vec{w} = -2\vec{u}$.

3. Two of the vectors have the same magnitude, which are they?

$$|\vec{t}| = |\vec{v}| = \sqrt{2}.$$

4. Find a unit vector in the direction of \vec{t}

Since $|\vec{t}| = \sqrt{2}$, a unit vector in the direction of \vec{t} is simply $\frac{1}{\sqrt{2}}\vec{t}$.

5. The vector \vec{v} is perpendicular to which of the other vectors?

The vector \vec{v} is perpendicular to all the other vectors, since $\vec{v} \cdot \vec{t} = \vec{v} \cdot \vec{u} = \vec{v} \cdot \vec{w} = 0$.