

Each problem is worth 5 points. Clear and complete justification is required for full credit.

Use the vectors $\vec{u} = 3\vec{i} + 2\vec{j} - \vec{k}$ and $\vec{v} = -2\vec{i} + \vec{j} + 2\vec{k}$ for the following problems:

1. Find $\|\vec{u}\|$.

$$\begin{aligned}\|\vec{u}\| &= \sqrt{v_1^2 + v_2^2 + v_3^2} \\ &= \sqrt{3^2 + 2^2 + (-1)^2} \\ &= \sqrt{9 + 4 + 1} \\ &= \boxed{\sqrt{14}}\end{aligned}$$

Good

2. Find a unit vector in the direction of \vec{v} .

Unit vector $\vec{x} = \frac{\vec{v}}{\|\vec{v}\|}$

$$\begin{aligned}\|\vec{v}\| &= \sqrt{(-2)^2 + 1^2 + 2^2} \\ &= \sqrt{4 + 1 + 4} \\ &= \sqrt{9} \\ &= \underline{3}\end{aligned}$$

$$\frac{\vec{v}}{\|\vec{v}\|} = \frac{-2\vec{i} + \vec{j} + 2\vec{k}}{3}$$

$$\vec{x} = -\frac{2}{3}\vec{i} + \frac{1}{3}\vec{j} + \frac{2}{3}\vec{k}$$

Nice!

3. Find $\vec{u} \cdot \vec{v}$.

$$\begin{aligned}\vec{u} \cdot \vec{v} &= u_1 v_1 + u_2 v_2 + u_3 v_3 \\ &= (3 \cdot -2) + (2 \cdot 1) + (-1 \cdot 2) \\ &= -6 + 2 - 2\end{aligned}$$

$$\vec{u} \cdot \vec{v} = \boxed{-6}$$

Good