

Each problem is worth 5 points. For full credit indicate clearly how you reached your answer.

1. For the vector $\mathbf{v} = 3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$, find a unit vector in the direction of \mathbf{v} .

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

$$\begin{aligned} \text{mag } v \Rightarrow |\vec{v}| &= \sqrt{9+4+1} \\ &= \sqrt{14} \end{aligned}$$

$$\text{unit vector} = \frac{1}{\sqrt{14}} (3\hat{i} - 2\hat{j} + \hat{k})$$

$$= \frac{3}{\sqrt{14}}\hat{i} - \frac{2}{\sqrt{14}}\hat{j} + \frac{\hat{k}}{\sqrt{14}} \quad \text{Great in direction of } \checkmark$$

2. Determine whether the vectors $\mathbf{a} = \langle -2, 3, 1 \rangle$ and $\mathbf{b} = \langle 5, 3, 2 \rangle$ are perpendicular or not. Make it clear how you can tell.

if \mathbf{a} and \mathbf{b} are perpendicular,

$$\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}||\mathbf{b}|\cos\theta = \underline{0}$$

$$\mathbf{a} \cdot \mathbf{b} = \langle -2 \cdot 5 + 3 \cdot 3 + 1 \cdot 2 \rangle$$

$$= \langle -10 + 9 + 2 \rangle$$

$$= \underline{1}$$

So they are not perpendicular.

Excellent