

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

1. Suppose $\mathbf{a} = 3\mathbf{i} - 4\mathbf{k}$ and $\mathbf{b} = 5\mathbf{i} - \mathbf{j} + 2\mathbf{k}$. Find $\mathbf{a} + \mathbf{b}$ and $\mathbf{a} - \mathbf{b}$.

$$\mathbf{a} + \mathbf{b}: (3\hat{i} - 4\hat{k}) + (5\hat{i} - 1\hat{j} + 2\hat{k}) = \underline{(8\hat{i} - 1\hat{j} - 2\hat{k})}$$

$$\mathbf{a} - \mathbf{b}: (3\hat{i} + 0\hat{j} - 4\hat{k}) - (5\hat{i} - 1\hat{j} + 2\hat{k}) = \underline{(-2\hat{i} + 1\hat{j} - 6\hat{k})}$$

Good

2. Find a unit vector in the direction of $\mathbf{v} = \langle 6, -3, 2 \rangle$.

$$\begin{aligned} \|\langle 6, -3, 2 \rangle\| &= \sqrt{(6)^2 + (-3)^2 + (2)^2} \\ &= \sqrt{36 + 9 + 4} \\ &= \sqrt{49} \\ &= 7 \end{aligned}$$

So, the unit vector is

$$\begin{aligned} &\frac{1}{\|\mathbf{v}\|} \times \mathbf{v} \\ &= \underline{\langle 6/7, -3/7, 2/7 \rangle} \end{aligned}$$

Excellent