

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

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

$$\begin{aligned} * 2\mathbf{a} &= 2(-2\mathbf{i} - 3\mathbf{k}) = -4\mathbf{i} - 6\mathbf{k} \\ \rightarrow 2\mathbf{a} + \mathbf{b} &= (-4\mathbf{i} - 6\mathbf{k}) + (5\mathbf{i} - \mathbf{j} + 2\mathbf{k}) = \underline{i - \mathbf{j} - 4\mathbf{k}} \end{aligned}$$

$$\begin{aligned} * 5\mathbf{a} &= 5(-2\mathbf{i} - 3\mathbf{k}) = -10\mathbf{i} - 15\mathbf{k} \\ \rightarrow 5\mathbf{a} - \mathbf{b} &= (-10\mathbf{i} - 15\mathbf{k}) - (5\mathbf{i} - \mathbf{j} + 2\mathbf{k}) \\ &= \underline{-15\mathbf{i} + \mathbf{j} - 17\mathbf{k}} \end{aligned} \quad \text{Great}$$

2. Find the magnitude of the vector $\langle -8, 6 \rangle$.

$$\|\vec{v}\| = \sqrt{a^2 + b^2}$$

$$\|\vec{v}\| = \sqrt{(-8)^2 + (6)^2}$$

$$\|\vec{v}\| = \sqrt{64 + 36}$$

$$\|\vec{v}\| = \sqrt{100}$$

$$\|\vec{v}\| = \underline{10} \quad \text{Good}$$

3. Find a unit vector in the direction of $\mathbf{v} = 2\mathbf{i} - \mathbf{j} - 2\mathbf{k}$.

$$\underline{\underline{\vec{u} = \frac{\vec{v}}{|\vec{v}|}}}}$$

$$\underline{\underline{\vec{u} = \frac{2}{3}\vec{i} - \frac{1}{3}\vec{j} - \frac{2}{3}\vec{k}}}}$$

$$|\vec{v}| = \sqrt{(2)^2 + (-1)^2 + (-2)^2}$$

$$= \sqrt{4 + 1 + 4}$$

$$= \sqrt{9}$$

$$= \underline{3}$$

Excellent!

$$\text{or } \underline{\underline{\left\langle \frac{2}{3}, -\frac{1}{3}, -\frac{2}{3} \right\rangle}}$$