

7. Find the vector of length 10 which has the same direction as $\vec{b} = 2\vec{i} - 3\vec{j} + 3\vec{k}$.

$$\text{Ans} = \frac{10}{\|\vec{b}\|} \vec{b} = \frac{10}{\sqrt{22}} (2\vec{i} - 3\vec{j} + 3\vec{k})$$

8. (There is no partial credit for this problem. Make sure your answer is correct.) Let $\vec{a} = -2\vec{i} + 3\vec{j}$ and $\vec{b} = 2\vec{i} - 2\vec{j} + 3\vec{k}$. Find vectors \vec{u} and \vec{v} with $\vec{b} = \vec{u} + \vec{v}$, \vec{u} parallel to \vec{a} , and \vec{v} perpendicular to \vec{a} .

$$\vec{u} = \text{Proj}_{\vec{a}} \vec{b} = \frac{\vec{a} \cdot \vec{b}}{\vec{a} \cdot \vec{a}} \vec{a} = \frac{-4 - 6}{13} (-2\vec{i} + 3\vec{j})$$

$$\vec{v} = \vec{b} - \vec{u} = \frac{1}{13} (26\vec{i} - 26\vec{j} + 39\vec{k}) + \frac{1}{13} (-20\vec{i} + 30\vec{j})$$

$$\vec{v} = \frac{1}{13} (6\vec{i} + 4\vec{j} + 39\vec{k})$$

$$\vec{u} = \frac{10}{13} (-2\vec{i} + 3\vec{j})$$

