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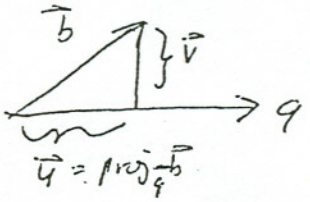
7. Find the vector of length 3 which has the same direction as $\vec{b} = 3\vec{i} - 2\vec{j} + 3\vec{k}$.

$$\frac{3\vec{b}}{\|\vec{b}\|} = \frac{3(3\vec{i} - 2\vec{j} + 3\vec{k})}{\sqrt{9+4+9}}$$

8. **(There is no partial credit for this problem. Make sure your answer is correct.)** Let $\vec{a} = -2\vec{i} + 4\vec{j}$ 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 $\vec{a}$.




$$\vec{u} = \frac{\vec{a}\cdot\vec{b}}{\vec{a}\cdot\vec{a}}\vec{a} = \frac{-4-8}{4+16}\vec{a} = \frac{-12}{20}\vec{a} = -\frac{3}{5}\vec{a}$$

$$\vec{u} = -\frac{3}{5}(-2\vec{i} + 4\vec{j})$$

$$\vec{v} = \vec{b} - \vec{u} = \frac{1}{5}\left(10\vec{i} - 10\vec{j} + 15\vec{k} + 3(-2\vec{i} + 4\vec{j})\right)$$

$$\vec{v} = \frac{1}{5}(4\vec{i} + 2\vec{j} + 15\vec{k})$$

Observe $\vec{u} \parallel \vec{a}$

$\vec{v} \perp \vec{a}$

$\vec{u} + \vec{v} = \vec{b}$