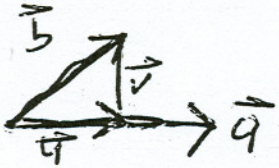
2. **(There is no partial credit for this problem. Make sure your answer is correct.)** Let $\vec{a} = -3\vec{i} + 4\vec{j} + 3\vec{k}$ and $\vec{b} = 4\vec{i} + 3\vec{j} + 2\vec{k}$. Find vectors $\vec{u}$ and $\vec{v}$ with $\vec{b} = \vec{u} + \vec{v}$, $\vec{u}$ parallel to $\vec{a}$, and $\vec{v}$ perpendicular to $\vec{a}$.



$$\vec{u} = \text{proj}_{\vec{a}}\vec{b} = \frac{\vec{a}\cdot\vec{b}}{\vec{a}\cdot\vec{a}}\vec{a} = \frac{-12+12+6}{9+16+9}\vec{a} = \frac{6}{34}\vec{a}$$

$$\vec{u} = \frac{-18}{34}\vec{i} + \frac{24}{34}\vec{j} + \frac{18}{34}\vec{k}$$

$$\vec{v} = \vec{b} - \vec{u} = \frac{136}{34}\vec{i} + \frac{102}{34}\vec{j} + \frac{68}{34}\vec{k} - \left(\frac{-18}{34}\vec{i} + \frac{24}{34}\vec{j} + \frac{18}{34}\vec{k}\right)$$

$$\vec{v} = \frac{154}{34}\vec{i} + \frac{78}{34}\vec{j} + \frac{50}{34}\vec{k}$$