Special Problem 2-4.20

Vectors $\hat{\mathbf{a}}, \hat{\mathbf{b}}, \hat{\mathbf{c}}$ form an **orthonormal** set of vectors.

Vector $\mathbf{A}$ is some arbitrary discrete vector, and:

$$\mathbf{A} \cdot \hat{\mathbf{a}} = 10\sqrt{6} \qquad \mathbf{A} \cdot \hat{\mathbf{b}} = -5\sqrt{6} \qquad \mathbf{A} \cdot \hat{\mathbf{c}} = \sqrt{6}$$

Vectors $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$ **also** form an orthonormal set of vectors. The following is known about these vectors:

$$\hat{\mathbf{a}} \cdot \hat{\mathbf{i}} = \frac{1}{\sqrt{6}} \qquad \hat{\mathbf{b}} \cdot \hat{\mathbf{i}} = \frac{1}{\sqrt{6}} \qquad \hat{\mathbf{c}} \cdot \hat{\mathbf{i}} = \frac{-2}{\sqrt{6}}$$

$$\hat{\mathbf{j}} = \frac{1}{5\sqrt{2}}\left(3\,\hat{\mathbf{a}} + 4\,\hat{\mathbf{b}} + 5\,\hat{\mathbf{c}}\right)$$

$$\mathbf{A} \cdot \hat{\mathbf{k}} = 12\sqrt{5}$$

Express vector $\mathbf{A}$ in terms of orthonormal base vectors $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$ (e.g., $\mathbf{A} = A_i\,\hat{\mathbf{i}} + A_j\,\hat{\mathbf{j}} + A_k\,\hat{\mathbf{k}}$)