Kittel

(3) 1.1

$$\vec{a}_1 \cdot \vec{a}_2 = \frac{1}{2}a(\hat{x}+\hat{y}-\hat{z}) \cdot \frac{1}{2}a(-\hat{x}+\hat{y}+\hat{z})$$

$$= \frac{1}{4}a^2[-1+1-1] = -\frac{1}{4}a^2$$

$$\vec{a}_1 \cdot \vec{a}_2 = \cos\theta\,|\vec{a}_1||\vec{a}_2|, \quad |\vec{a}_1| = \frac{1}{2}a\sqrt{1+1+1}$$

$$= \frac{\sqrt{3}}{2}a = |\vec{a}_2|.$$

$$\cos\theta \frac{\sqrt{3}}{2}a \frac{\sqrt{3}}{2}a = -\frac{1}{4}a^2.$$

$$3\cos\theta = -1, \quad \cos\theta = -\frac{1}{3}, \quad \boxed{\theta = \cos^{-1}\left(-\frac{1}{3}\right) \approx 109.47^\circ}$$