[24]

$$\vec{a} = 5\hat{i} + 4\hat{j} - 6\hat{k}$$
$$-\vec{b} = 2\hat{i} - 2\hat{j} - 3\hat{k}$$

a)

$$+c = 4\hat{i} + 3\hat{j} + 2\hat{k}$$

$$\vec{r} = 11\hat{i} + 5\hat{j} - 7k$$

$$|\vec{r}| = \sqrt{121+25+49} = \sqrt{195} \approx 14$$

b) $$\cos\theta = \frac{\vec{r}\cdot\hat{k}}{|\vec{r}|\,|\hat{k}|} = \frac{-7}{14} \Rightarrow \theta = \cos^{-1}\left(-\tfrac{1}{2}\right) \Rightarrow \theta = 120^\circ$$

[36]

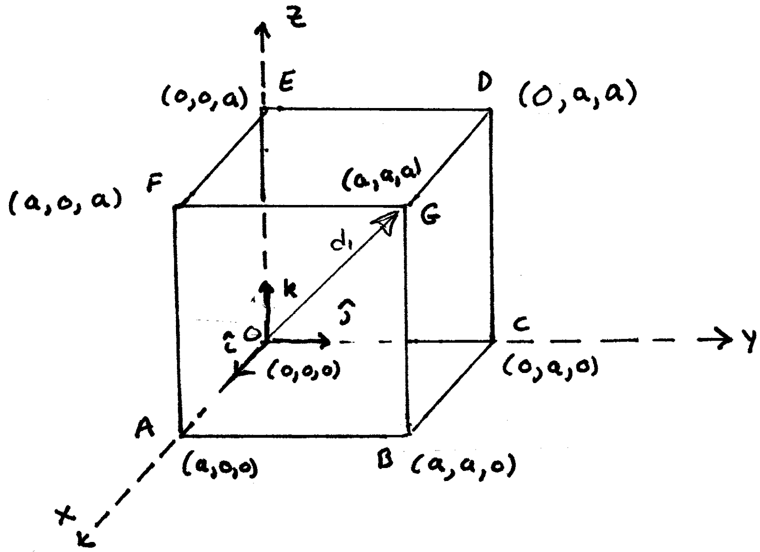
$$\vec{a} = 3\hat{i} + 3\hat{j} - 3\hat{k}$$
$$\vec{b} = 2\hat{i} + \hat{j} + 3\hat{k}$$

$$\vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}|\cos\theta$$

$$\cos\theta = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}||\vec{b}|} = \frac{6+3-9}{\sqrt{27}\,\sqrt{14}} = 0$$

Then $\theta = 90^\circ$

[37]



a) diagonal

$\overrightarrow{OG} = a\hat{i} + a\hat{j} + a\hat{k}$

$\overrightarrow{EB} = (a-0)\hat{i} + (a-0)\hat{j} + (0-a)\hat{k} = a\hat{i} + a\hat{j} - a\hat{k}$

$\overrightarrow{CF} = (a-0)\hat{i} + (0-a)\hat{j} + (a-0)\hat{k} = a\hat{i} - a\hat{j} + a\hat{k}$

$\overrightarrow{DA} = (0-a)\hat{i} + (0-a)\hat{j} + (0-a)\hat{k} = a\hat{i} - a\hat{j} - a\hat{k}$

Negatives of these correct, too. direction is arbitrary.

b) compute angle of $\overrightarrow{OG}$ with z-axis. By symmetry, this answers all.

$$\cos\theta = \frac{\overrightarrow{OG} \cdot a\hat{k}}{|\overrightarrow{OG}|\,|a\hat{k}|} = \frac{\vec{ak} \cdot \vec{ak}}{\sqrt{a^2+a^2+a^2}\;a} = \frac{a^2}{a^2\sqrt{3}} = \frac{1}{\sqrt{3}}$$

then $\theta = \cos^{-1}\left(\frac{1}{\sqrt{3}}\right) \approx .96$ RAD $\approx 54.7^\circ$ ANS

c) LEN DIAG. use $\overrightarrow{OG}$ and others are EQ to it

$$|\overrightarrow{OG}| = \sqrt{a^2 + a^2 + a^2} = a\sqrt{3} \quad \text{ANS}$$

d) PICK $\overrightarrow{OG}$ and $\overrightarrow{EB}$.

$$\cos\theta = \frac{\overrightarrow{OG} \cdot \overrightarrow{EB}}{|\overrightarrow{OG}|\,|\overrightarrow{EB}|} = \frac{a^2 + a^2 - a^2}{3a^2} = \frac{a^2}{3a^2} = \frac{1}{3}$$

Then $\theta = \cos^{-1}\left(\frac{1}{3}\right) \approx 1.2$ RAD $\approx 70.5^\circ$ ANS