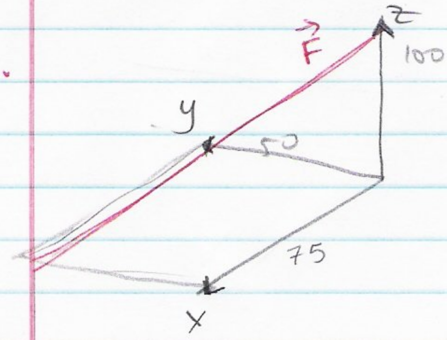
MATH 250 Homework 3 Solutions (Selected Problems)

11.2 #24 Set of points that satisy $xyz > 0$ is the union of 4 octants

1) $x>0,\ y>0,\ z>0$
2) $x>0,\ y<0,\ z<0$
3) $x<0,\ y>0,\ z<0$
4) $x<0,\ y<0,\ z>0$.

- Above quadrants I and III in xy-plane ($x \cdot y$ is positive, z is positive)
- Below quadrats II and IV in xy-plane (xy is negative, z is negative)

#112.



$|\vec{F}| = 550$

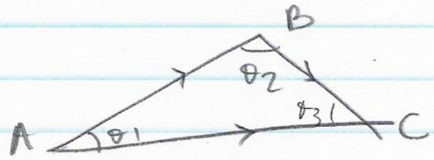
Direction of $\vec{F}$ is $\langle 75, -50, 100\rangle$

So,

$$\vec{F} = 550 \cdot \frac{\langle 75, -50, 100\rangle}{\sqrt{75^2+50^2+100^2}} \rightarrow \text{normalize!}$$

$$\vec{F} \cong \langle 306, -204, 409\rangle$$

11.3 #30. Vertices of a triangle are: A $(2,-7,3)$, B $(-1,5,8)$, C $(4,6,-1)$



$\vec{AB} = \langle -3, 12, 5\rangle \Rightarrow \|AB\| = \sqrt{9+144+25} = \sqrt{178}$

$\vec{BC} = \langle 5, 1, -9\rangle \Rightarrow \|BC\| = \sqrt{25+1+81} = \sqrt{107}$

$\vec{AC} = \langle 2, 13, -4\rangle \Rightarrow \|AC\| = \sqrt{4+169+16} = \sqrt{189} = 17$

$$\cos\theta_1 = \frac{\vec{AB}\cdot\vec{AC}}{\|AB\|\ \|AC\|} = \frac{-5+156-20}{\sqrt{178}\cdot 17} \Rightarrow \theta_1 = 44.42^\circ$$

$$\cos\theta_2 = \frac{\vec{BA}\cdot\vec{BC}}{\|BA\|\ \|BC\|} = \frac{-\vec{AB}\cdot\vec{BC}}{\|AB\|\ \|BC\|} = \frac{-(-15+12-45)}{\sqrt{178}\ \sqrt{107}} = \frac{48}{\sqrt{178\times 107}}$$

$$\Rightarrow \theta_2 = 69.65^\circ$$

Since $\theta_1+\theta_2+\theta_3 = 180^\circ$,

$\theta_3 = 180^\circ - \theta_1 - \theta_2$

$\theta_3 = 180^\circ - 44.42^\circ - 69.65 = 65.93^\circ$

So, $\triangle ABC$ is an acute triangle.