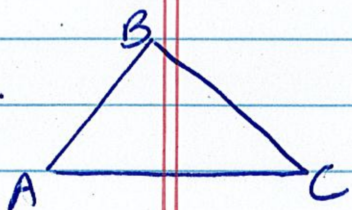
p. 299 12 G

3. a) $\vec{AB} = \begin{pmatrix} 4 \\ -1 \\ -3 \end{pmatrix}$ $\vec{BA} = \begin{pmatrix} -4 \\ 1 \\ 3 \end{pmatrix}$ b) $|\vec{AB}| = |\vec{BA}| = \sqrt{4^2+(-1)^2+(-3)^2}$
$= \sqrt{26}$

4. $\vec{OA} = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}$ $\vec{OB} = \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}$ $\vec{AB} = \begin{pmatrix} -4 \\ 0 \\ 2 \end{pmatrix}$

7. a) use point $(0,1,0)$
$d = \sqrt{(3-0)^2+(1-1)^2+(-2-0)^2}$
$d = \sqrt{13}$

b) use $(0,0,0)$
$d = \sqrt{(3-0)^2+(1-0)^2+(-2-0)^2}$
$d = \sqrt{14}$

9. 

a) $\vec{AB} = \begin{pmatrix} 2 \\ 8 \\ -2 \end{pmatrix}$, $|\vec{AB}| = \sqrt{72}$

$\vec{AC} = \begin{pmatrix} -9 \\ 6 \\ 15 \end{pmatrix}$, $|\vec{AC}| = \sqrt{342}$

$\vec{BC} = \begin{pmatrix} -11 \\ -2 \\ 17 \end{pmatrix}$, $|\vec{BC}| = \sqrt{414}$

Since $(\sqrt{72})^2 + (\sqrt{342})^2 = (\sqrt{414})^2$ the Δ is a right Δ.

b) $\vec{AB} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$

$\vec{AC} = \begin{pmatrix} 3 \\ 6 \\ 9 \end{pmatrix}$

$\vec{BC} = \begin{pmatrix} 2 \\ 4 \\ 6 \end{pmatrix}$

These vectors are scalar multiples of each other. This means they are parallel to each other, so no Δ can be formed.

p. 307 #9 a) $|a| = \sqrt{2^2+(-1)^2+(-2)^2} = 3$, so $\pm\frac{1}{3}\begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$.

b) $|b| = \sqrt{(-2)^2+(-1)^2+2^2} = 3$, so $\pm\frac{2}{3}\begin{pmatrix} -2 \\ -1 \\ 2 \end{pmatrix}$

p. 310

#3 a) $p \cdot q = 3(-2) + -1(1) + 2(3)$
$= -1$

b) $\cos\theta = \dfrac{-1}{\sqrt{14} \cdot \sqrt{14}}$
$\theta = 94.1°$

#4 a) $\cos\theta = \dfrac{2(-1) + -1(3) + -1(2)}{\sqrt{2^2 + (-1)^2 + (-1)^2} \cdot \sqrt{(-1)^2 + 3^2 + 2^2}}$
$\theta = 140°$

b) $m = \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix}$ $n = \begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$

$\cos\theta = \dfrac{0(1) + 2(0) - 1(2)}{\sqrt{5} \cdot \sqrt{5}}$
$\theta = 114°$

10. a) $3(-2) + t(1) = 0$
$\boxed{t = 6}$

b) $t(3) + (t+2)(-4) = 0$
$-t - 8 = 0$
$\boxed{t = -8}$

c) $t(2-3t) + (t+2)(t) = 0$
$2t - 3t^2 + t^2 + 2t = 0$
$-2t^2 + 4t = 0$
$-2t(t-2) = 0$ so $\boxed{t = 0, 2}$

11. a) $-\frac{3}{2}\begin{pmatrix} -2 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \\ -3/2 \end{pmatrix}$, so $t = -3/2$

b) $\begin{pmatrix} 3k \\ -4k \end{pmatrix} = \begin{pmatrix} t \\ t+2 \end{pmatrix}$, so $3k = t$ and $-4k = t+2$
$-4k = 3k + 2$
$-7k = 2$
$k = -2/7$

$3\left(-\frac{2}{7}\right) = t$
$\boxed{\text{so } -\frac{6}{7} = t}$

#11 (continued) c) $\begin{pmatrix} kt \\ k(t+2) \end{pmatrix} = \begin{pmatrix} 2-3t \\ t \end{pmatrix}$

so $kt = 2-3t$ and $kt + 2k = t$

$$k(t+2) = t$$

$$k = \frac{t}{t+2}$$

$$\left(\frac{t}{t+2}\right)t = 2-3t$$

$$\frac{t^2}{t+2} = \frac{2-3t}{1}$$

$$t^2 = (t+2)(2-3t)$$

$$t^2 = -3t^2 - 4t + 4$$

$$4t^2 + 4t - 4 = 0$$

$$4(t^2 + t - 1) = 0$$

$$t = \frac{-1 \pm \sqrt{1^2 - 4(1)(-1)}}{2} = \frac{-1 \pm \sqrt{5}}{2}$$ (Yuck!)

12. a) $1(2) + 1(3) + 5(-1) = 0$, so the vectors are $\perp$.

c) i) $3(2t) + -1(-3) + -t(-4) = 0$

$$2t + 3 = 0$$

$$t = -3/2$$

ii) $3(1-t) + t(-3) - 2(4) = 0$

$$3 - 3t - 3t - 8 = 0$$

$$-6t - 5 = 0$$

$$t = -\frac{5}{6}$$