Vector Lines HW

p. 325 #1 a) $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} + t\begin{pmatrix} 1 \\ 4 \end{pmatrix}$, $\begin{matrix} x = 3+t \\ y = -4+4t \end{matrix}$, $y = 4x - 16$

b) $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 2 \end{pmatrix} + t\begin{pmatrix} -2 \\ 5 \end{pmatrix}$, $\begin{matrix} x = 5-2t \\ y = 2+5t \end{matrix}$, $y = \frac{-5}{2}x + \frac{29}{2}$

c) $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -6 \\ 0 \end{pmatrix} + t\begin{pmatrix} 3 \\ 7 \end{pmatrix}$, $\begin{matrix} x = -6+3t \\ y = 7t \end{matrix}$, $y = \frac{7}{3}x + 14$

d) $\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -1 \\ 11 \end{pmatrix} + t\begin{pmatrix} -2 \\ 1 \end{pmatrix}$, $\begin{matrix} x = -1-2t \\ y = 11+t \end{matrix}$, $x + 2y = 21$

#2 a) $\begin{matrix} x = -1+2t \\ y = 4-t \end{matrix}$ b) $t=0,\ (-1,4)$ $t=-1,\ (-3,5)$
$t=1,\ (1,3)$ $t=-4,\ (-9,8)$
$t=3,\ (5,1)$

#5 a) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \\ -7 \end{pmatrix} + t\begin{pmatrix} 2 \\ 1 \\ 3 \end{pmatrix}$, $\begin{matrix} x = 1+2t \\ y = 3+t \\ z = -7+3t \end{matrix}$

b) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} + t\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}$, $\begin{matrix} x = t \\ y = 1+t \\ z = 2-2t \end{matrix}$

c) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -2 \\ 2 \\ 1 \end{pmatrix} + t\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$, $\begin{matrix} x = -2+t \\ y = 2 \\ z = 1 \end{matrix}$

d) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix} + t\begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$, $\begin{matrix} x = 2t \\ y = 2-t \\ z = -1+3t \end{matrix}$

#6 a) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix} + t\begin{pmatrix} -2 \\ 1 \\ 1 \end{pmatrix}$ b) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 3 \end{pmatrix} + t\begin{pmatrix} 3 \\ 0 \\ -4 \end{pmatrix}$

c) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 5 \end{pmatrix} + t\begin{pmatrix} 0 \\ -3 \\ 0 \end{pmatrix}$ d) $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ -1 \end{pmatrix} + t\begin{pmatrix} 5 \\ -2 \\ 4 \end{pmatrix}$

p. 327

#1 $L_1: \begin{pmatrix}-4\\3\end{pmatrix} + t\boxed{\begin{pmatrix}12\\5\end{pmatrix}}$

$L_2: \begin{pmatrix}0\\-6\end{pmatrix} + s\boxed{\begin{pmatrix}3\\-4\end{pmatrix}}$

Write in vector form first.
Then use direction vectors.

$$\cos\theta = \frac{12(3)+5(-4)}{\sqrt{169}\cdot\sqrt{25}}$$

$\theta = 75.7^\circ$

#2 $L_1: \begin{pmatrix}2\\19\end{pmatrix} + p\begin{pmatrix}5\\-2\end{pmatrix}$

$L_2: \begin{pmatrix}3\\7\end{pmatrix} + r\begin{pmatrix}4\\10\end{pmatrix}$

$$\cos\theta = \frac{5(4)-2(10)}{\sqrt{29}\cdot\sqrt{116}}$$

$\theta = 90^\circ$, so $L_1 \perp L_2$

#4 a) $$\cos\theta = \frac{3(3)-16(8)+7(-5)}{\sqrt{314}\cdot\sqrt{98}}$$

$\theta = 151^\circ$

b) $L_1 \cdot L_3 = 0$

$3(0)-16(-3)+7x = 0$

$7x = -48$

$x = -\frac{48}{7}$

#5 a) $y = x-3 \rightarrow$ direction $\begin{pmatrix}1\\1\end{pmatrix}$

$y = -\frac{3}{2}x + \frac{11}{2} \rightarrow$ direction $\begin{pmatrix}2\\-3\end{pmatrix}$

$$\cos\theta = \frac{1(2)+1(-3)}{\sqrt{2}\cdot\sqrt{13}}$$

$\theta = 101^\circ$ (or 78.7°)

b) direction L_1 is $\begin{pmatrix}1\\1\end{pmatrix}$

direction L_2 is $\begin{pmatrix}1\\-3\end{pmatrix}$

$$\cos\theta = \frac{1(1)+1(-3)}{\sqrt{2}\cdot\sqrt{10}}$$

$\theta = 117^\circ$ (or 63.4°)

c) $y = -x+7 \rightarrow$ direction $\begin{pmatrix}1\\-1\end{pmatrix}$

$y = \frac{1}{3}x + \frac{2}{3} \rightarrow$ direction $\begin{pmatrix}3\\1\end{pmatrix}$

$$\cos\theta = \frac{1(3)-1(1)}{\sqrt{2}\cdot\sqrt{10}}, \quad \theta = 63.4^\circ \text{ or } 117^\circ$$

d) direction L_1 is $\begin{pmatrix}1\\-1\end{pmatrix}$

direction L_2 is $\begin{pmatrix}2\\1\end{pmatrix}$

$$\cos\theta = \frac{1(2)-1(1)}{\sqrt{2}\cdot\sqrt{5}}, \quad \theta = 71.6^\circ \text{ or } 108^\circ$$