1. (a) (10)

$$x = \frac{(8)(-1) - 6(-3)}{8-6} = 5$$

$$y = \frac{8(-4) - 6(-2)}{8-6} = 5$$

$\therefore P(5,5)$

(b) (10)

$M(8,10)$

$N(18,20)$

$P(13,15)$

$A(12,14)$

$B(-12,-10)$

For point A

$$x = \frac{(6)(18) + 9(8)}{6+9} = 12$$

$$y = \frac{(6)(20) + (9)(10)}{6+9} = 14$$

For point B.

$$x = \frac{(6)(18) - (9)(8)}{6-9} = -12$$

$$y = \frac{(6)(20) - (9)(10)}{6-9} = -10$$

$$PA = \sqrt{(13-12)^2 + (15-14)^2} = \sqrt{2}$$

$$PB = \sqrt{(13+12)^2 + (15+10)^2} = 25\sqrt{2}$$

$$MB = \sqrt{(18+12)^2 + (10+10)^2} = 20\sqrt{2}$$

$$PA \cdot PB = (MB)^2$$

$$(\sqrt{2})(25\sqrt{2}) = (20\sqrt{2})^2$$

$$50 \neq 800$$

2. (10)

$1+3s = 3-t$

$2+5s = s-2t$

$3+8s = 8-3t$

$$\therefore \left(\begin{array}{cc|c} 3 & 1 & 2 \\ 5 & 2 & 3 \\ 8 & 3 & 5 \end{array}\right) \rightarrow \left(\begin{array}{cc|c} 3 & 1 & 2 \\ 0 & 1/3 & -1/3 \\ 0 & 0 & 0 \end{array}\right) \rightarrow \left(\begin{array}{cc|c} 3 & 0 & 3 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{array}\right) \rightarrow \left(\begin{array}{cc|c} 1 & 0 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{array}\right)$$

$\therefore \quad s = 1$

$t = -1$

$\therefore \quad x = 1+3(1) = 4$

$y = 2+5(1) = 7$

$z = 3+8(1) = 11$

$\therefore$ (4, 7, 11)

3. (10)

$$D = \frac{|c_1 - c_2|}{\sqrt{a^2+b^2}} = \frac{|-10-(-40)|}{\sqrt{1^2+2^2}} = \frac{30}{\sqrt{5}} \text{ or } 13.4164.$$

$a = 1$

$b = 2$

$c_1 = -10$

$c_2 = -40$

4. (10)

$MN = \frac{5-3}{1-5} = \frac{2}{-4}$

$\therefore \quad y-3 = -\frac{2}{4}(x-5)$

$4y = -2x+22$

$OP: \quad y-6 = 2(x-6)$

$y = 2x-6$

$\therefore \quad 4y = -2x+22$
$y = 2x-6$ $\Big\} \rightarrow$

$$\begin{array}{r} 2x+4y = 22 \\ -2x+y = -6 \\ \hline 5y = 16 \end{array}$$

$y = 16/5$

$\therefore \quad \frac{16}{5} = 2x-6$

$46/5 = 2x \Rightarrow x = \frac{23}{5}$

$\therefore P\left(\frac{23}{5}, \frac{16}{5}\right)$

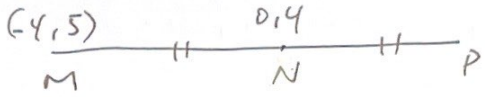
$P(4.6, 3.2)$

5. $M(-4,5)$ and $N(0,4)$

(5) (a) $y - y_0 = m(x - x_0)$

$y - 5 = -\frac{1}{4}(x+4)$

$x + 4y = 16$ //.



(5) (b) Midpt.: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$\therefore P\left(\frac{-4+x_2}{2}, \frac{5+y_2}{2}\right)$

$P(x_2, y_2)$

$P(4,3)$

$\begin{cases} \frac{-4+x_2}{2} = 0 \\ x_2 = 4 \end{cases}$ $\quad \frac{5+y_2}{2} = 4$, $y_2 = 3$

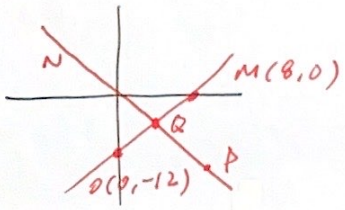
6.

(10) M and O

$3x - 2y = 24$

$x = 0 \quad y = -12$

$y = 0 \quad x = 8$



$M(8,0) \quad O(0,-12) \quad Q = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$Q = \left(\frac{0+8}{2}, \frac{-12+0}{2}\right)$

$Q(4,-6)$

slope of MO $\Rightarrow 3x - 2y = 24$

$\Rightarrow y = \frac{3}{2}x - 12$

$m = 3/2$

NP $m = -2/3 \quad \therefore y - y_0 = m(x - x_0)$

$y + 6 = -\frac{2}{3}(x-4)$

$3y + 18 = -2x + 8$

$2x + 3y + 10 = 0$

7. (10)

$2x + y - 4z - 4 = 0$

$x = t \quad y = 2 + 3t \quad z = t$

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

$2t + 2 + 3t - 4t - 4 = 0$

$t - 2 = 0$

$t = 2$

when $t = 2$

$\therefore x = 2$

$y = 2 + 3(2) = 8$

$z = 2$

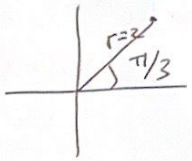
$\therefore (2, 8, 2)$

8. (a) (10)

$x = r\cos\theta = 2\cos\frac{\pi}{3} = 1$

$y = r\sin\theta = 2\sin\pi/3 = \sqrt{3}$

$\therefore (1, \sqrt{3})$



$(2, \pi/3)$
r, θ

(b) (10)

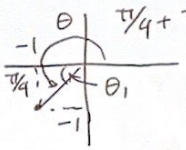
$(-1, -1)$
$x \quad y$

$r = \sqrt{(-1)^2 + (-1)^2}$

$r = \sqrt{2}$

$\theta = \tan^{-1}(1/1)$

$\theta_1 = \pi/4$



$\pi/4 + \pi = 5\pi/4$

$\therefore (\sqrt{2}, 5\pi/4 + 2\pi n, n \in I)$