1) $(2, 1)$ $(4, -5)$

$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-5 - 1}{4 - 2}$$

$$= \frac{-6}{2}$$

$$= -3$$

$y = -3x + c$ $(2, 1)$

$1 = -3(2) + c$

$1 = -6 + c$

$c = 7$

$$\underline{y = -3x + 7}$$

2/ l_1 : $2x + 3y + 5 = 0$

$3y = -2x - 5$

$y = -2/3\,x - 5/3$

Gradient of $l_1 = -2/3$.

l_2 : $(1, 7)$ $(5, 1)$

$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{1 - 7}{5 - 1}$$

$$= \frac{-6}{4}$$

$$= \frac{-3}{2}$$

Gradient of $l_2 = -3/2$

l_1 and l_2 are not parallel $-\frac{2}{3} \neq -3/2$

l_1 and l_2 are not perpendicular $-\frac{2}{3} \times -\frac{3}{2} \neq -1$

They are neither.

3a) $(-2, 5)$ $(5, -1)$

x_1 y_1 x_2 y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{-1 - 5}{5 - -2}$$

$$= \frac{-6}{7}$$

$$y = -\frac{6}{7}x + c \qquad (-2, 5)$$

$$5 = -\frac{6}{7}(-2) + c$$

$$5 = \frac{12}{7} + c$$

$$c = \frac{23}{7}$$

$$y = -\frac{6}{7}x + \frac{23}{7}$$

$$7y = -6x + 23$$

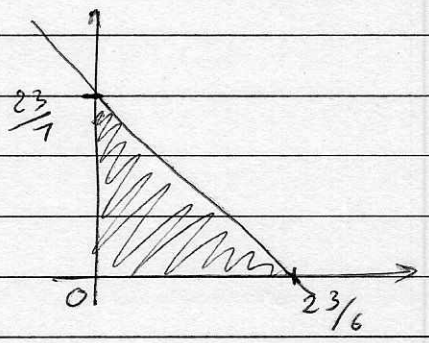
$$\underline{\underline{6x + 7y - 23 = 0}}$$

b) crosses y at $(0, 23/7)$

crosses x when $y = 0$

$$6x = 23$$

$$x = 23/6$$



Area = $\frac{1}{2}$ base × height

$$= \frac{1}{2}\left(\frac{23}{6}\right)\left(\frac{23}{7}\right)$$

$$= \frac{529}{84} \text{ units}^2$$

4) $(-1, k+2)$ $(2k-3, 8)$

x_1 y_1 x_2 y_2

$$\frac{1}{3} = \frac{8-(k+2)}{2k-3--1}$$

$$\frac{1}{3} = \frac{8-k-2}{2k-2}$$

$$\frac{1}{3} = \frac{6-k}{2k-2}$$

$$2k-2 = 3(6-k)$$

$$2k-2 = 18-3k$$

$$5k = 20$$

$$k = 4$$

b) $m = \frac{1}{3}$ $(-1, 6)$

$$y = \frac{1}{3}x + c$$

$$6 = \frac{1}{3}(-1) + c$$

$$6 = -\frac{1}{3} + c$$

$$c = \frac{19}{3} \qquad y = \frac{1}{3}x + \frac{19}{3}$$

c) Midpoint of AB $\left(\frac{-1+5}{2}, \frac{6+8}{2}\right)$

$(2, 7)$

perpendicular gradient $= -3$

$$y = -3x + c$$

$$7 = -3(2) + c$$

$$7 = -6 + c$$

$$c = 13 \qquad y = -3x + 13$$

$$3x + y - 13 = 0$$

5 $2x - 3y + 24 = 0$

Crosses x when $y = 0$

$2x + 24 = 0$

$x = -12$

Crosses y when $x = 0$

$-3y + 24 = 0$

$y = 8$

$(-12, 0)$ and $(0, 8)$

Midpoint $(-6, 4)$

distance to origin $= \sqrt{6^2 + 4^2}$

$= \underline{\underline{2\sqrt{13}}}$

6/ $y = 2x + c \qquad (5, 7)$

$7 = 2(5) + c$

$7 = 10 + c$

$c = -3$

$y = 2x - 3$

b/ perpendicular gradient $= -\frac{1}{2}$

$y = -\frac{1}{2}x + 1$

7 $5x + 2y - 4 = 0$ ①

$x - 4y + 1 = 0$ ②

$x = (4y - 1)$ ②

$5(4y - 1) + 2y - 4 = 0$

$20y - 5 + 2y - 4 = 0$

$22y - 9 = 0$

$22y = 9$

$y = 9/22$

$x = 4\left(\frac{9}{22}\right) - 1$

$x = \frac{7}{11}$

$\left(\frac{7}{11}, \frac{9}{22}\right)$

8 $2x - 3y = 4$

$3y = 2x - 4$

$y = \frac{2}{3}x - \frac{4}{3}$

l_1 gradient $= 2/3$

perpendicular gradient $= -3/2$

$y = -3/2\,x + c \qquad (4, -1)$

$-1 = -\frac{3}{2}(4) + c$

$-1 = -6 + c$

$c = 5$

$y = -3/2\,x + 5$

$2y = -3x + 10$

$3x + 2y - 10 = 0$

9a/ $(1, 4)$ $(-2, 13)$

x_1 y_1 x_2 y_2

$$m = \frac{13 - 4}{-2 - 1}$$

$$= \frac{9}{-3}$$

$$= \underline{\underline{-3}}$$

$$y = -3x + c \qquad (1, 4)$$

$$4 = -3(1) + c$$

$$4 = -3 + c$$

$$c = 7$$

$$\underline{\underline{y = -3x + 7}}$$

b/ change in $x = 3$

change in $y = 9$

$$\sqrt{3^2 + 9^2}$$

$$= \underline{\underline{3\sqrt{10}}}$$

10a) $y = 3x + c$ $\quad (-2, 5)$

$5 = 3(-2) + c$

$5 = -6 + c$

$c = 11$

$y = 3x + 11$

b) perpendicular gradient $= -\frac{1}{3}$

$y = -\frac{1}{3}x + 4$

c) $y = 3x + 11 \qquad y = -\frac{1}{3}x + 4$

$3x + 11 = -\frac{1}{3}x + 4$

$9x + 33 = -x + 12$

$10x + 33 = 12$

$10x = -21$

$x = \frac{-21}{10}$

$y = 3\left(\frac{-21}{10}\right) + 11$

$= \frac{47}{10}$

$\left(-\frac{21}{10}, \frac{47}{10}\right)$

11/ l_1 $\quad 5y - 10 = 2x$

when $x = 4$: $\quad 5y - 10 = 8$

$5y = 18$

$y = 18/5$

P: $(4, 18/5)$

l_1: $\quad 5y = 2x + 10$

$y = \frac{2}{5}x + 2$

l_2 gradient $= \frac{-5}{2}$

$y = -\frac{5}{2}x + c \qquad \left(4, \frac{18}{5}\right)$

$\frac{18}{5} = -\frac{5}{2}(4) + c$

$c = \frac{68}{5}$

$y = -\frac{5}{2}x + \frac{68}{5}$

$10y = -25x + 136$

$\underline{25x + 10y - 136 = 0}$

b/ lines cross x when $y = 0$

l_1: $\quad 5(0) - 10 = 2x$

$-10 = 2x$

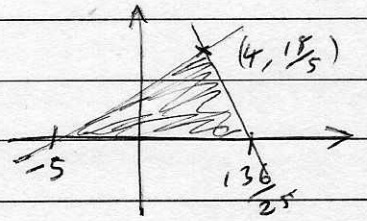
$x = -5$

l_2: $\quad 25x + 10(0) - 136 = 0$

$25x = 136$

$x = \frac{136}{25}$

$5 + \frac{136}{25} = \frac{261}{25}$



Area $= \frac{1}{2}$ base $\times$ height

$= \frac{1}{2}\left(\frac{261}{25}\right)\left(\frac{18}{5}\right) = \frac{2349}{125}$ units^2 $\quad (18.792)$