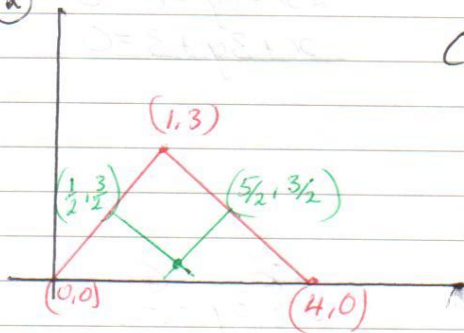


Ex 1.5

Q1 (i) $(2, -3)$ $(4, 0)$ $(-3, 9)$
 $\left(\frac{2+4-3}{3}, \frac{-3+0+9}{3}\right) \Rightarrow (1, 2)$

(ii) $(1, 3)$ $(6, 2)$ $(5, -2)$
 $\left(\frac{1+6+5}{3}, \frac{3+2-2}{3}\right) \Rightarrow (4, 1)$

(2)



Circumcentre \Rightarrow Bisect sides
 \Rightarrow mid pt
and $\perp \Rightarrow$ opp slopes

Slope $(1, 3)(4, 0) = \frac{-3}{3} = -1$

$m_{\perp} = 1$

$y - 3/2 = 1(x - 5/2)$ (x2)

$2y - 3 = 2x - 5$

$2x - 2y - 2 = 0$

Slope: $(0, 0)(1, 3) = 3/1 = 3$

$m_{\perp} = -1/3$

$y - 3/2 = -1/3(x - 1/2)$

$y - 3/2 = -x/3 + 1/6$ (x6)

$6y - 9 = -2x + 1$

$2x + 6y - 10 = 0$

$\ominus 2x - 2y = 2$

$2x + 6y = 10$

$8y = 8$

$y = 1$

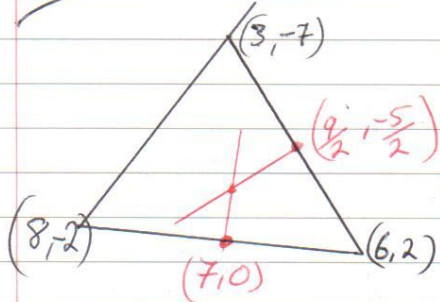
$2x - 2(1) = 2$

$2x = 4$

$x = 2$

Circumcentre is $(2, 1)$

Q3 Circumcentre.



$$\text{Slope } (3, -7) (6, 2) = \frac{9}{3} = 3$$

$$m_{\perp} = -\frac{1}{3}$$

$$\begin{aligned} \text{Eqn: } y + \frac{5}{2} &= -\frac{1}{3}(x - \frac{9}{2}) \\ y + \frac{5}{2} &= -\frac{1}{3}x + \frac{9}{6} \quad (\times 6) \end{aligned}$$

$$6y + 15 = -2x + 9$$

$$2x + 6y + 6 = 0$$

$$\underline{x + 3y + 3 = 0}$$

$$\text{Slope } (8, -2) (6, 2) = \frac{4}{2} = 2$$

$$m_{\perp} = \frac{1}{2}$$

$$\begin{aligned} \text{Eqn: } y - 0 &= \frac{1}{2}(x - 7) \\ y &= \frac{1}{2}x - \frac{7}{2} \quad (\times 2) \end{aligned}$$

$$2y = x - 7$$

$$\underline{x - 2y - 7 = 0}$$

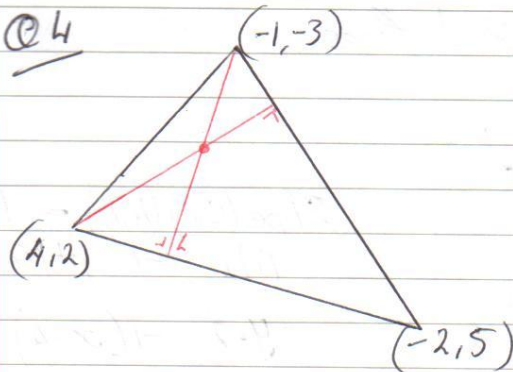
$$\begin{array}{r} \ominus x + 3y = -3 \\ \oplus x - 2y = 7 \\ \hline -5y = 10 \\ y = -2 \end{array}$$

$$x + 3(-2) = -3$$

$$x = 3$$

Circumcentre is $(3, -2)$

Q4



Orthocentre \Rightarrow \perp lines

$$\text{Slope } (4, 2) (-2, 5) = \frac{3}{-6} = -\frac{1}{2}$$

$$m_{\perp} = 2 \quad \text{pt } (-1, -3)$$

$$y + 3 = 2(x + 1)$$

$$y + 3 = 2x + 2$$

$$\underline{2x - y = 1}$$

$$\text{Slope } (-1, -3) (-2, 5) = \frac{8}{-1} = -8$$

$$m_{\perp} = \frac{1}{8} \quad \text{pt } (4, 2)$$

$$y - 2 = \frac{1}{8}(x - 4)$$

$$8y - 16 = x - 4$$

$$\underline{x - 8y = -12}$$

$$2x - y = 1$$

$$x - 8y = -12 \quad (x - 2)$$

$$\underline{2x - y = 1}$$

$$-2x + 16y = 24$$

$$15y = 25$$

$$y = \frac{25}{15} = \frac{5}{3}$$

$$2x - \frac{5}{3} = 1$$

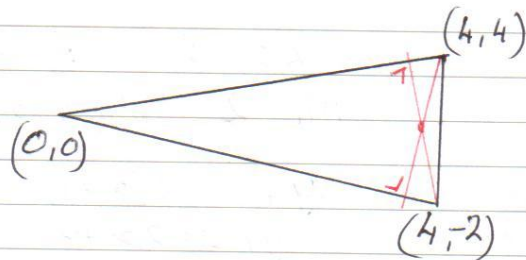
$$6x - 5 = 3$$

$$6x = 8$$

$$x = \frac{8}{6} = \frac{4}{3}$$

Orthocentre is $\left(\frac{4}{3}, \frac{5}{3}\right)$

Q5 Orthocentre \Rightarrow \perp lines



$$\text{Slope}(0,0)(4,4) = 1$$

$$m_{\perp} = -1 \text{ pt}(4,-2)$$

$$y+2 = -1(x-4)$$

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

$$\underline{x+y=2}$$

$$\text{Slope}(0,0)(4,-2) = -2/4 = -1/2$$

$$m_{\perp} = 2 \text{ pt}(4,4)$$

$$y-4 = 2(x-4)$$

$$y-4 = 2x-8$$

$$\underline{2x-y=4}$$

$$2x+y=4$$

$$\underline{x+y=2}$$

$$3x=6$$

$$x=2$$

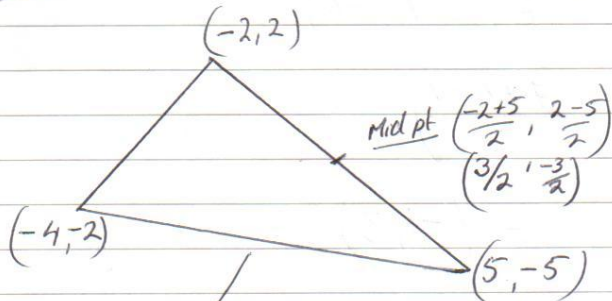
$$x+y=2$$

$$2+y=0$$

$$y=0$$

Orthocentre (2,0)

Q6 Circumcentre \Rightarrow Mid pt \perp



$$\text{Slope} = \frac{-7}{7} = -1$$

$$m_{\perp} = 1$$

$$\text{Mid pt } \left(\frac{-4+5}{2}, \frac{-2-5}{2}\right) = \left(\frac{1}{2}, -\frac{7}{2}\right)$$

$$\text{Slope} = \frac{-3}{9} = -\frac{1}{3}$$
$$m_{\perp} = 3$$

$$\text{Eqn: slope } 1 \text{ \& pt } \left(\frac{3}{2}, -\frac{3}{2}\right)$$
$$y + \frac{3}{2} = 1(x - \frac{3}{2}) \quad (\times 2)$$

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

$$\underline{2x - 2y = 6}$$

$$\text{Eqn: slope } 3 \text{ \& pt } \left(\frac{1}{2}, -\frac{7}{2}\right)$$

$$y + \frac{7}{2} = 3(x - \frac{1}{2}) \quad (\times 2)$$

$$2y + 7 = 6x - 3$$

$$\underline{6x - 2y = 10}$$

$$6x - 2y = 10$$
$$\ominus \frac{2x + 2y = 6}{\hline 4x = 4}$$
$$x = 1$$

$$2(1) - 2y = 6$$

$$-2y = 4$$

$$y = -2$$

Circumcentre is $(1, -2)$

Q7 Centroid \Rightarrow formula.
(-2, 7) (4, 6) (k, -4)

$$\left(\frac{-2+4+k}{3}, \frac{7+6-4}{3} \right)$$

$$\left(\frac{2+k}{3}, 3 \right) = (-1, 3)$$

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

$$2+k = -3$$

$$k = -5$$