

HW 1C: HL# 2e, 3, 5, 8 ; SL# 2e, 3, 5, 7

2e.) $O(0,0)$, $P(9,0)$ midpoint = $\left(\frac{0+9}{2}, \frac{0+0}{2}\right) = \left(\frac{9}{2}, 0\right)$

gradient = $\frac{0-0}{9-0} = \frac{0}{9} = 0 \therefore$ gradient of perpendicular bisector is undefined.

- Equations that have an undefined slope are vertical lines in the form $x=d$, where d is the x -intercept. Given that the midpoint is $\left(\frac{9}{2}, 0\right)$, the x -intercept is $\frac{9}{2}$.

$\therefore \boxed{x = \frac{9}{2}}$

3.) $P(6,-1)$, $Q(2,5)$ midpoint = $\left(\frac{6+2}{2}, \frac{-1+5}{2}\right) = \left(\frac{8}{2}, \frac{4}{2}\right) = (4, 2)$

gradient = $\frac{5+1}{2-6} = \frac{6}{-4} = -\frac{3}{2} \therefore$ gradient of p.b. is $\frac{2}{3}$

\therefore a.) $2x - 3y = 2(4) - 3(2) \Rightarrow \boxed{2x - 3y = 2}$

b.) $R(1,0) \Rightarrow 2(1) - 3(0) = 2$
 $2 - 0 = 2$

$2 = 2 \checkmark$ true

c.) use distance formula

$PR = \sqrt{(6-1)^2 + (-1-0)^2} = \sqrt{(5)^2 + (-1)^2} = \sqrt{25+1} = \sqrt{26} \checkmark$

$QR = \sqrt{(2-1)^2 + (5-0)^2} = \sqrt{(1)^2 + (5)^2} = \sqrt{1+25} = \sqrt{26} \checkmark$

$\boxed{\text{distance is } \sqrt{26} \text{ units for both } PR \neq QR.}$

5.) $3x - 2y + 1 = 0$, midpoint $(3, 5)$.

a.) i. $-\left(\frac{3}{-2}\right) = \frac{-3}{-2} = \frac{3}{2}$ ii. $\frac{-2}{3}$

b.) $2x + 3y + d = 0$; $-d = 2(3) + 3(5)$ substitute midpoint
 $-d = 6 + 15$

$\therefore d = -21$

$2x + 3y - 21 = 0$

8.) $A(1, 2), B(4, 5), C(2, -1)$

a.) i. mid: $\left(\frac{1+4}{2}, \frac{2+5}{2}\right) = \left(\frac{5}{2}, \frac{7}{2}\right)$ $m = \frac{5-2}{4-1} = \frac{3}{3} = 1 \therefore p.b. = -1$

$x + y = \frac{5}{2} + \frac{7}{2} \Rightarrow x + y = \frac{12}{2} \Rightarrow x + y = 6$

ii. mid: $\left(\frac{1+2}{2}, \frac{2-1}{2}\right) = \left(\frac{3}{2}, \frac{1}{2}\right)$ $m = \frac{-1-2}{2-1} = \frac{-3}{1} = -3 \therefore p.b. = \frac{1}{3}$

$x - 3y = \frac{3}{2} - 3\left(\frac{1}{2}\right) \Rightarrow x - 3y = \frac{3}{2} - \frac{3}{2} \Rightarrow x - 3y = 0$

iii. mid: $\left(\frac{4+2}{2}, \frac{5-1}{2}\right) = (3, 2)$ $m = \frac{-1-5}{2-4} = \frac{-6}{-2} = 3 \therefore p.b. = -\frac{1}{3}$

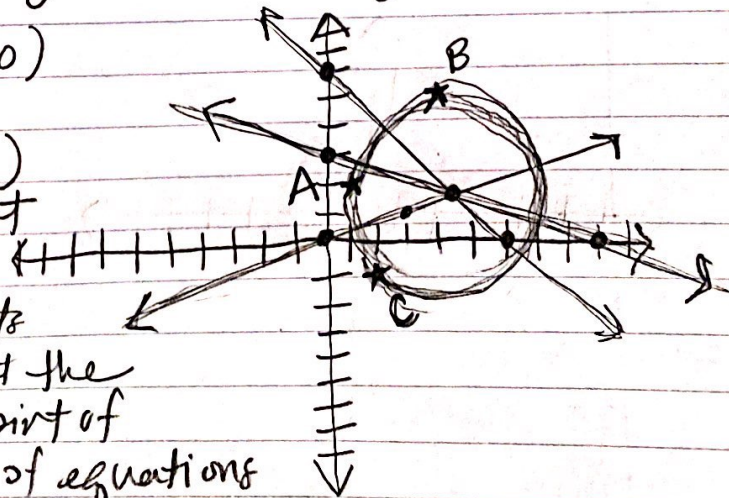
$x + 3y = 3 + 3(2) \Rightarrow x + 3y = 3 + 6 \Rightarrow x + 3y = 9$

b.) $x + y = 6 \rightarrow (0, 6) \neq (6, 0)$

$x - 3y = 0 \rightarrow (0, 0)$ $m = \frac{1}{3}$

$x + 3y = 9 \rightarrow (0, 3) \neq (9, 0)$

All 3 lines intersect at a point



c.) Drawing a circle about points $A, B,$ and C , you can see that the center of the circle is the point of intersection. Solve the system of equations to find the center point.