2.5 Verifying Geometric Properties

ex1: Show that the diagonals of the rhombus with vertices R(-5,2), S(-1,3), T(-2,-1) and U(-6, -2) are perpendicular and bisect each other

-ve reciprocal slopes

$$m_{RT} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-2}{-2-(-5)} = \frac{-3}{3} = -1$$

$-2-(-5)$

$-2+5$

$$m_{US} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-3}{-6+1} = \frac{-5}{-5} = 1$$

Slopes are -ve reciprocals to each other, $\therefore$ the diagonals are perpendicular

$$M_{RT} = \left(\frac{x_2+x_1}{2}, \frac{y_1+y_2}{2}\right) \quad M_{US} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$= \frac{-5+(-2)}{2}, \frac{2+(-1)}{2} \quad = \frac{-1+-6}{2}, \frac{3+(-2)}{2}$$

$$= \frac{-7}{2}, \frac{1}{2} \quad = -\frac{7}{2}, \frac{1}{2}$$

$$d_{RM} = \sqrt{\left(-5-\left(-\frac{7}{2}\right)\right)^2 + \left(2-\frac{1}{2}\right)^2}$$

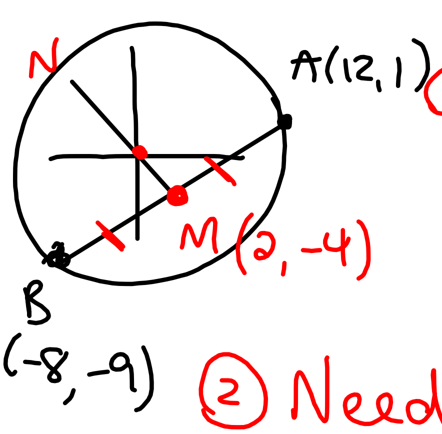
$$d_{RM} = \sqrt{(-5+3.5)^2 + (2-0.5)^2}$$

$$d_{RM} = \sqrt{2.25 + 2.25}$$

$$d_{RM} = \sqrt{4.5}$$

$$d_{MT} =$$

ex 2: The points A(12, 1), B(-8, -9) lie on the circle defined by $x^2 + y^2 = 145$. Show that the bisector of the chord AB passes through the centre of the circle



① $M_{AB} = \frac{x_1+x_2}{2}, \frac{y_2+y_1}{2}$

$= \frac{12-8}{2}, \frac{1-9}{2}$

$= 2, -4$

② Need m_{AB} so we can then use -ve reciprocal for slope of m_{MN}.

$m_{AB} = \frac{y_2-y_1}{x_2-x_1}$

$= \frac{-9-1}{-8-12}$

$= \frac{-10}{-20}$

$= \frac{1}{2}$

$\therefore m_{MN} = -2$

③ Need equation of line $\therefore y = mx+b$

$-4 = -2(2)+b$

$-4+4 = b$

$0 = b$

$y = -2x$

origin (0,0)

$0 = -2(0)$

$0 = 0$

L.S = R.S.

∴ yes, the line goes through the origin.

P 109 #1-5
8, 9
13, 14, 15] one of these