

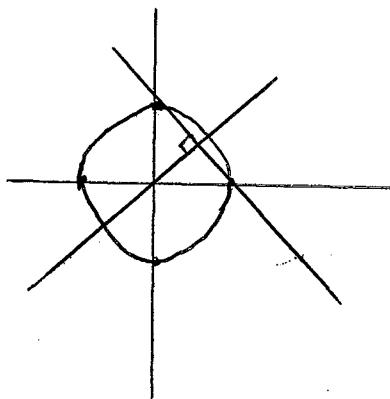
1. The right bisector of a chord of a circle passes through the centre of the circle.

A chord is a line segment whose endpoints are on the circle.

On the circle

- construct a chord
- construct the right bisector of the chord

The right bisector passes through the centre



Example:

A circle has the equation  $x^2 + y^2 = 25$ . The points  $A(-3,4)$  and  $B(5,0)$  are endpoints of chord AB.

Verify that the centre of the circle lies on the right bisector of chord AB.

Right Bisector: We need to use midpoint and  $m_{\perp}$

$$M_{AB} = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left( \frac{-3 + 5}{2}, \frac{4 + 0}{2} \right) = (1, 2)$$

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 4}{5 - (-3)} = \frac{-4}{8} = -\frac{1}{2}$$

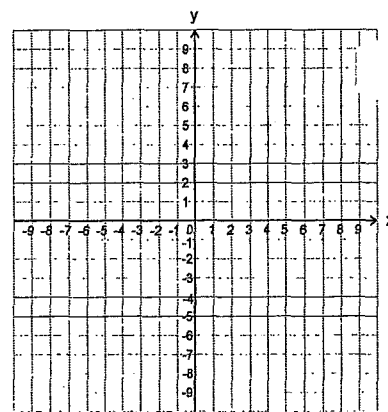
$$m_{\perp} = 2 \quad \text{point } (1, 2)$$

$$y = m(x - x_1) + y_1$$

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

$$= 2x - 2 + 2$$

$$\boxed{y = 2x}$$



Centre  $(0,0)$  eqn:  $y = 2x$

LS	RS
$y$	$2x$
$0$	$2(0)$
$0$	$0$

LS = RS

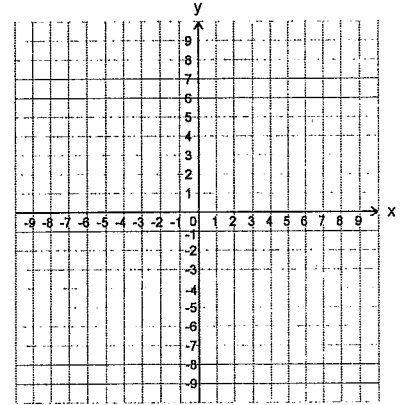
$\therefore (0,0)$  is on the right bisector.

2. There is only one circle that passes through three given non-collinear points.

Example:

Find the centre of the circle that passes through the points  $E(-5,0)$ ,  $F(-2,3)$ , and  $G(6,-11)$ . Determine the length of the radius of the circle.

Since the right bisectors pass through the centre, find POI of 2 right bisectors. [Circumcentre].



$$\text{For } \underline{EF}: M_{EF} = \left( \frac{-5-2}{2}, \frac{0+3}{2} \right) = (-3.5, 1.5)$$

$$m_{EF} = \frac{3-0}{-2-5} = \frac{3}{-3} = -1$$

$$m_{\perp} = 1 \text{ Point } (-3.5, 1.5)$$

$$y = m(x - x_1) + y_1$$

$$= -1(x + 3.5) + 1.5$$

$$= -x - 3.5 + 1.5$$

$$\boxed{y = -x - 2} \quad (1)$$

$$\text{For } \underline{EG}: M_{EG} = \left( \frac{-5+6}{2}, \frac{0-11}{2} \right) = (0.5, -5.5)$$

$$m_{EG} = \frac{-11-0}{6-5} = \frac{-11}{1} = -11$$

$$m_{\perp} = 1 \text{ point } (0.5, -5.5)$$

$$y = m(x - x_1) + y_1$$

$$= 1(x - 0.5) - 5.5$$

$$= x - 0.5 - 5.5 = x - 6 \quad (2)$$

Find POI.

$$y = -x - 2$$

$$y = x - 6$$

$$+ \quad 2y = -8$$

$$y = -4$$

sub  $y = -4$  in (1)

$$-4 = -x - 2$$

$$-x = -2$$

$$x = 2$$

$\therefore$  POI which is the centre is  $(2, -4)$

To check:  $d_{EC} = d_{FC} = d_{GC}$