Thread 3 - Mini - Test 2 Part B

1. $m_{line_Q} = -\frac{3}{4}$

2a) $A(-2, -5)$ $B(0, 6)$

x_2 y_2 x_1 y_1

$$l_{AB} = \sqrt{(-2-(0))^2 + (-5-(6))^2}$$
$$= \sqrt{(-2)^2 + (-11)^2}$$
$$= \sqrt{4 + 121}$$
$$= \sqrt{125}$$
$$\doteq 11.2$$

b) $$M_{AB} = \left(\frac{-2+0}{2}, \frac{-5+6}{2}\right)$$
$$= \left(\frac{-2}{2}, \frac{1}{2}\right)$$
$$= \left(-1, \frac{1}{2}\right)$$

c) $$x^2 + y^2 = r^2$$
$$x^2 + y^2 = 6^2$$
$$x^2 + y^2 = 36$$

B(0, 6) is on the y-axis, so the radius is 6.

3. $A = \pi r^2$

$$\frac{1963.5}{\pi} = \frac{\pi r^2}{\pi}$$

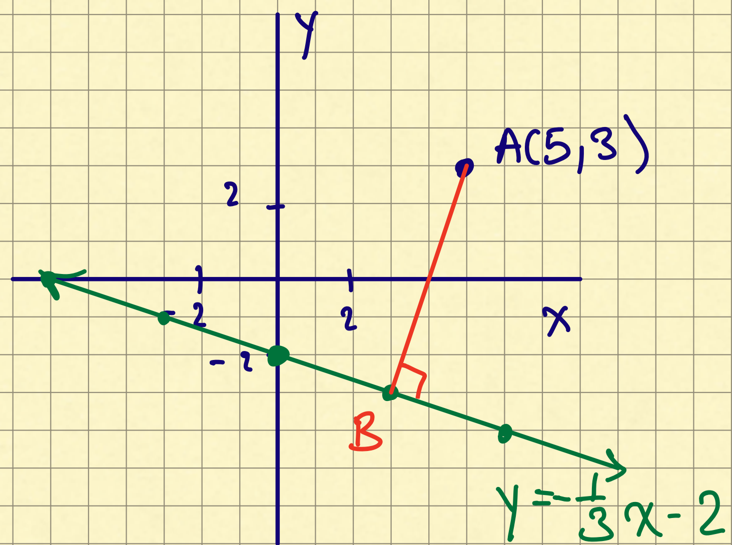
$$\frac{1963.5}{\pi} = r^2$$

$$625 \doteq r^2$$

$\therefore$, the equation of the circle that defines the outer boundary of the range is $x^2 + y^2 = \frac{1963.5}{\pi}$

or approximately $x^2+y^2 = 625$.

4.



Let point B be the point where a perpendicular line segment meets the given line.

Given slope for line is $-\frac{1}{3}$.

$$\therefore m_{AB} = \frac{3}{1}$$
$$= 3$$

Get equation of line segment AB:

$$y = mx + b$$
$$3 = 3(5) + b$$
$$3 = 15 + b$$
$$-15 \quad -15$$
$$-12 = b$$

$\therefore$ equation of AB is $y = 3x - 12$

Now get intersection point B.

$$y = -\frac{1}{3}x - 2 \quad (A)$$
$$y = 3x - 12 \quad (B)$$

sub (A) into (B):

$$-\frac{1}{3}x - 2 = 3x - 12$$
$$3\left(-\frac{1}{3}x - 2\right) = \left(3x - 12\right)3$$
$$-x - 6 = 9x - 36$$
$$+x \qquad\qquad +x$$
$$-6 = 10x - 36$$
$$+36 \qquad\qquad +36$$
$$\frac{30}{10} = \frac{10x}{10}$$
$$3 = x$$

→ sub x into (B)

$$y = 3(3) - 12$$
$$y = 9 - 12$$
$$y = -3$$

∴ the co-ordinates of B are $(3, -3)$

Get l_{AB}.

$A(5, 3)$
$\;\;\; x_1 \; y_1$

$B(3, -3)$
$\;\;\; x_2 \; y_2$

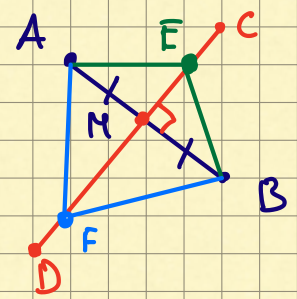
$$l_{AB} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(3-5)^2 + (-3-3)^2}$$
$$= \sqrt{(-2)^2 + (-6)^2}$$
$$= \sqrt{4 + 36}$$
$$= \sqrt{40}$$
$$\doteq 6.3$$

∴, the shortest distance AB is about 6.3 units.

5.

- get M_{PQ}
- get m_{PQ}
- slope of right bisector is negative reciprocal of m_{PQ}.
- use that slope and M_{PQ} to find equation of line from $y=mx+b$ formula.

6. No, Rachel is not correct.



Let point M be the midpoint. M is the same distance from A and B, by definition. However, any point on the right bisector CD is also equidistant from A and B.

For example, AE = EB.

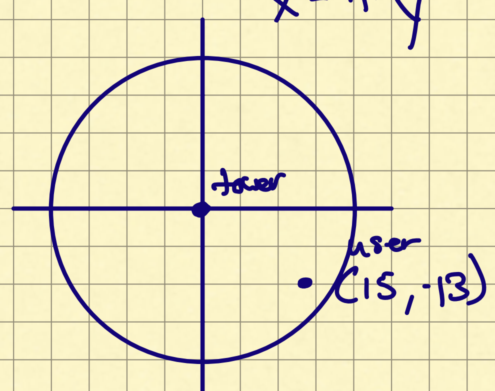
Also, AF = FB.

7.

Equation of range of cell tower is

$$x^2+y^2=(20)^2$$

$$x^2+y^2=400$$



Is the user's position inside the range of the tower?

$$x^2+y^2=r^2$$

$$(15)^2+(-13)^2=r^2$$

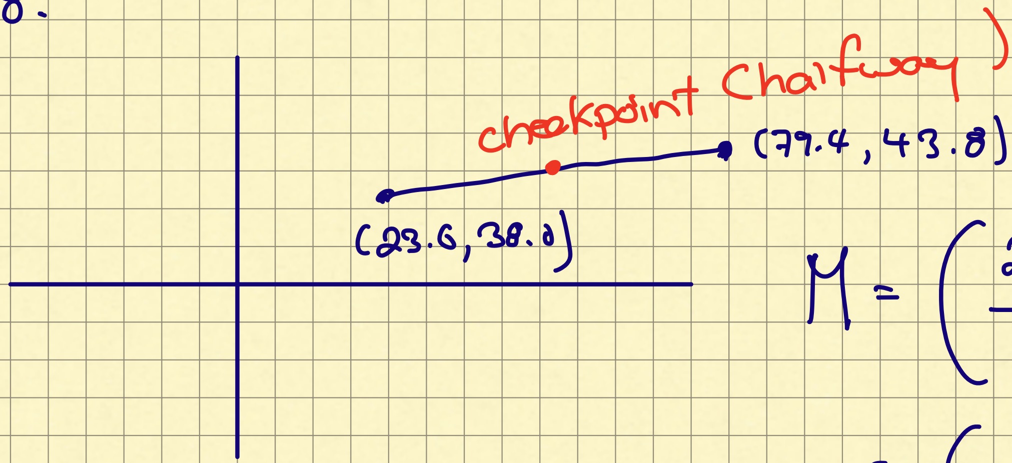
$$225+169=r^2$$

$$394 = r^2$$

$$19.8 \doteq r$$

$\because$ $19.8 < 20$, the user is in range of the cell tower (barely)!

8.



$$M = \left(\frac{23.6+79.4}{2}, \frac{38.0+43.8}{2}\right)$$

$$= \left(\frac{103}{2}, \frac{81.8}{2}\right)$$

$$= (51.5, 40.9)$$

$\therefore$, the checkpoint should be setup at the point (51.5, 40.9).