

Problems Involving Circles and Lines

Review:

Show that $A(2, 5)$ is on the graph of $3x - 2y = -4$

$$3(2) - 2(5) = -4$$

$$6 - 10 = -4$$

$$-4 = -4$$

Determine the equation of the line satisfying the conditions.

Express your answer in the form $Ax + By = C$

a) A line passes through $(4, 1)$ and $(9, -2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

$$m = \frac{-2 - 1}{9 - 4} = \frac{-3}{5}$$

$$y = mx + b$$

$$y = \frac{-3}{5}x + b$$

$$1 = \frac{-3}{5}(4) + b$$

$$1 = -\frac{12}{5} + b$$

$$1 + \frac{12}{5} = b$$

$$\frac{5}{5} + \frac{12}{5} = b$$

$$\frac{17}{5} = b$$

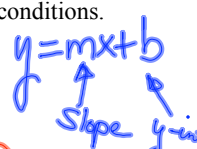
$$y = mx + b$$

$$y = \frac{-3}{5}x + \frac{17}{5}$$

$$Ax + By = C$$

$$5y = -3x + 17$$

$$3x + 5y = 17$$



b) The line is perpendicular to $3x - 2y = 10$ and passes through $(8, -5)$

$$y = mx + b$$

$$-2y = -3x + 10$$

$$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{10}{-2}$$

$$m = -\frac{2}{3}$$

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

$$y = mx + b$$

$$y = \frac{-2}{3}x + b$$

$$-5 = \frac{-2}{3}(8) + b$$

$$-5 = -\frac{16}{3} + b$$

$$-15 = -16 + 3b$$

$$1 = 3b$$

$$\frac{1}{3} = b$$

$$y = \frac{-2}{3}x + \frac{1}{3}$$

$$Ax + By = C$$

$$3y = -2x + 1$$

$$2x + 3y = 1$$

Graph the circle $(x+3)^2 + (y-1)^2 = 25$
and the line $x + 2y = 9$ on the same axis.

$$C = (-3, 1)$$

$$r = 5$$

$$y = mx + b$$

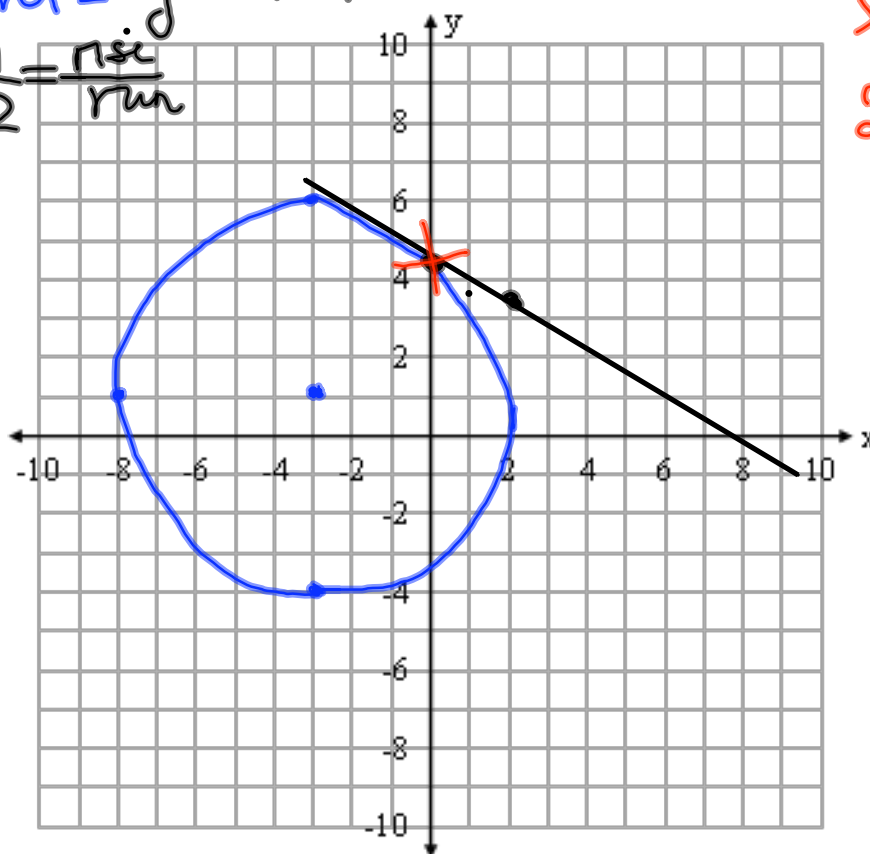
$$x + 2y = 9$$

$$2y = -x + 9$$

$$y = \frac{-1x}{2} + \frac{9}{2}$$

Point = y-int 4.5

$$\text{Slope} = \frac{-1}{2} = \frac{\text{rise}}{\text{run}}$$



Determine the exact coordinates of the points of intersection of

$$(x+3)^2 + (y-1)^2 = 25 \quad \text{and the line } x + 2y = 9$$

$$(9-2y+3)^2 + (y-1)^2 = 25$$

$$x = 9 - 2y$$

$$(12-2y)(12-2y) + (y-1)(y-1) = 25$$

$$144 - 24y - 24y + 4y^2 + y^2 - 1y - 1y + 1 = 25$$

$$5y^2 - 50y + 145 = 25$$

$$5y^2 - 50y + 120 = 0$$

$$5(y^2 - 10y + 24) = 0$$

$$\begin{array}{|c|} \hline 6 \\ \hline 4 \\ \hline 0 \\ \hline \end{array} \times 24$$

$$\frac{-6}{1} \quad \frac{-4}{1}$$

$$5(y-6)(y-4) = 0$$

$$y = 6$$

$$y = 4$$

$$x = 9 - 2y$$

$$x = 9 - 2(6)$$

$$x = -3$$

$$(-3, 6)$$

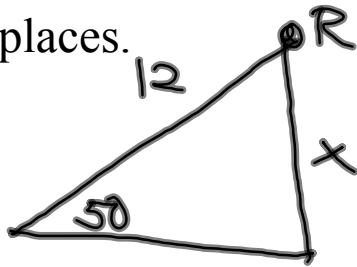
$$x = 9 - 2y$$

$$x = 9 - 2(4)$$

$$x = 1$$

$$(1, 4)$$

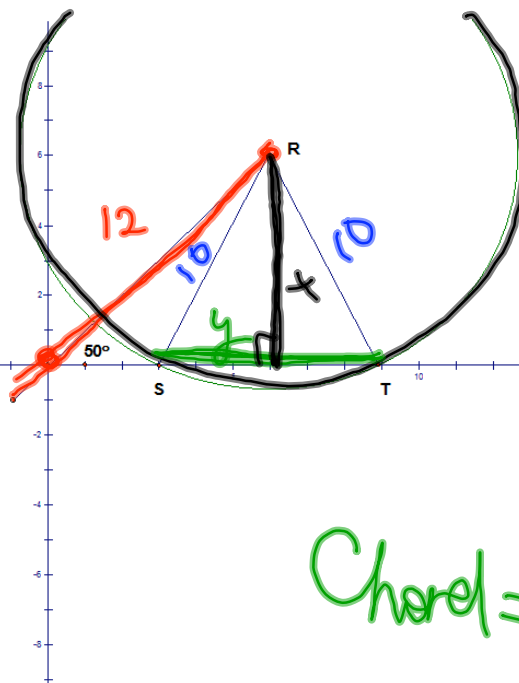
A line is drawn through the origin at an angle of 50° to the positive x-axis. R is a point on this line and R is 12 cm from the origin. With centre R, a circle is drawn with radius 10 cm. This circle intersects the x-axis at S and T. Calculate the length of chord ST, to 2 decimal places.



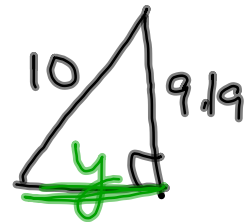
$$\sin 50 = \frac{x}{12}$$

$$x = \sin 50 (12)$$

$$x = 9.19$$



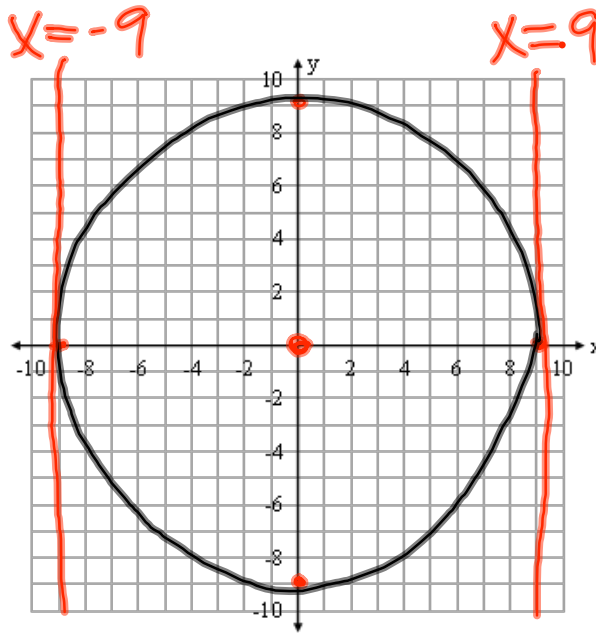
SOH
CAH
TOA



$$y = 3.94$$

$$\text{Chord} = 7.89 \text{ cm}$$

For what value of "k" is the line $x = k$ tangent to the circle $x^2 + y^2 = 81$

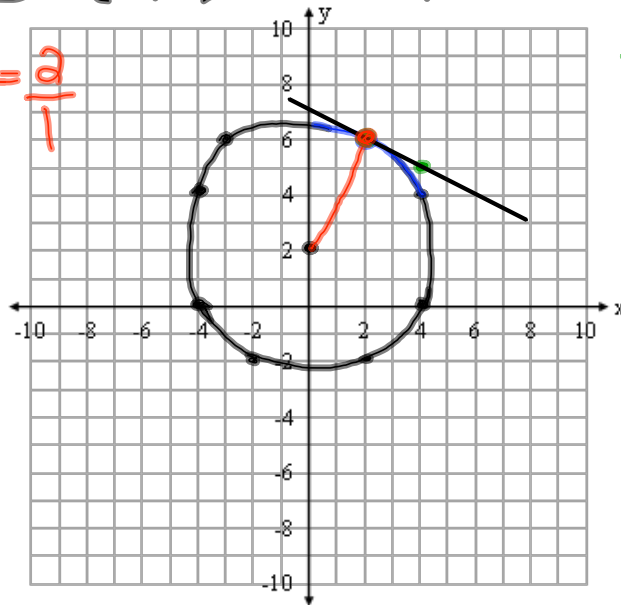


$x =$ ↖ vertical line
 $y =$ horizontal line

$$x = \pm 9$$

a) Graph the circle $x^2 + (y-2)^2 = 20$
 $C = (0, 2)$ $r = \sqrt{20}$

$$m = \frac{4}{2} = \frac{2}{1}$$



$4^2 + 2^2$
tangent line

$$m = -\frac{1}{2}$$

$$(2, 6)$$

$$\underline{y = mx + b}$$

b) Show that the point (2, 6) lies on the circle

$$\begin{aligned} & \underline{x^2 + (y-2)^2 = 20} \\ & 2^2 + (6-2)^2 = 20 \\ & 4 + 16 = 20 \\ & 20 = 20 \end{aligned}$$

c) Graph the tangent line to the circle at point (2, 6)

d) Determine the equation of the tangent line

$$y = -\frac{1}{2}x + b$$

$$6 = -\frac{1}{2}(2) + b$$

$$6 = -1 + b$$

$$b = 7$$

$$\underline{y = -\frac{1}{2}x + 7}$$