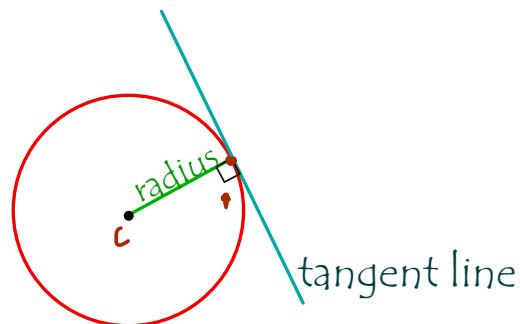
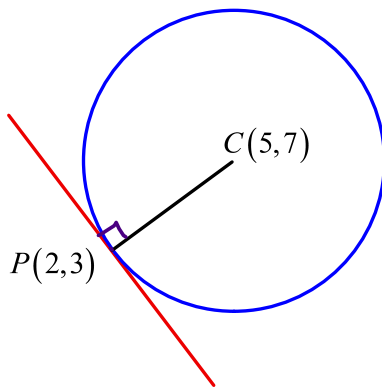


Tangents to Circles

- A tangent line is a line that shares only one point in common with the circle.
- A tangent line is perpendicular to the radius of the circle at the point of contact.



Example: Determine the equation of the tangent line.



$$y = ax + b$$

\uparrow slope \uparrow y-int

① slope of radius $a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{5 - 2} = \frac{4}{3}$

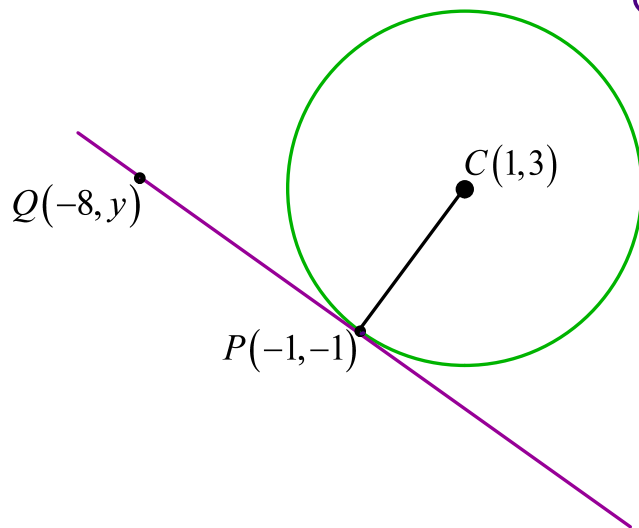
② slope of tangent = neg. reciprocal of a
 $= -\frac{3}{4}$ or -0.75

$$y = -0.75x + b$$

③ use $(2,3)$ as x & y $3 = -0.75(2) + b$
 $3 = -1.5 + b$
 $4.5 = b$

$$y = -0.75x + 4.5$$

Example: Determine y in the point $Q(-8, y)$.



① Eqⁿ of tan line

$$a_r = \frac{3+1}{1+1} = \frac{4}{2} = \frac{2}{1}$$

$$\therefore a_T = -\frac{1}{2} \text{ or } -0.5$$

$$y = ax + b \text{ using } (-1, -1)$$

$$-1 = (-0.5)(-1) + b$$

$$-1 = 0.5 + b$$

$$-1.5 = b$$

$$y = -0.5x - 1.5$$

② $Q(-8, y)$ let $x = -8$

$$y = -0.5(-8) - 1.5$$

$$y = 4 - 1.5$$

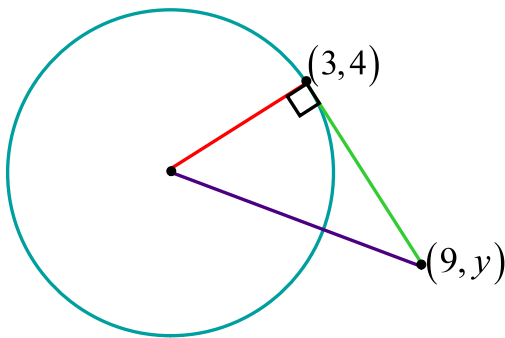
$$y = 2.5$$

Example: Given the diagram and the equation of the circle:

$$x^2 + y^2 + 2x - 2y - 23 = 0$$

Determine:

- the length of the radius.
- the domain and range of the circle.
- the value of y .



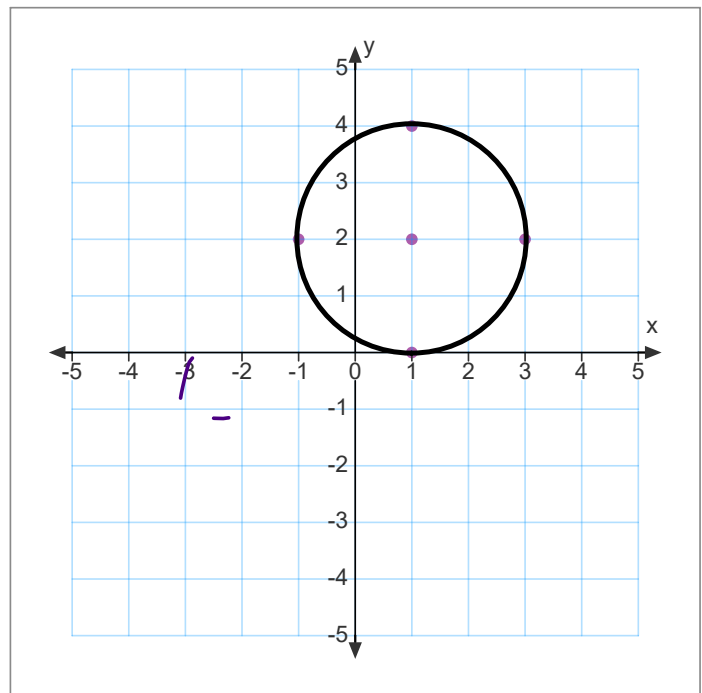
Inequalities and Circles

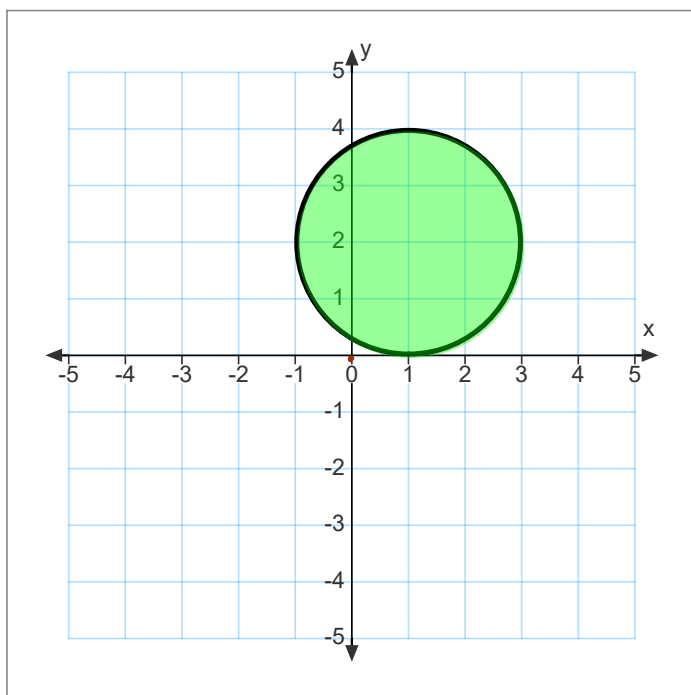
Example: Draw $(x-1)^2 + (y-2)^2 \leq 4$

1. Draw the circle
 $(x-1)^2 + (y-2)^2 = 4$
 C(1, 2) $r = \sqrt{4} = 2$

\leq solid

shade?





2) Test a point

$(0,0)$ outside

$$(x-1)^2 + (y-2)^2 \leq 4$$

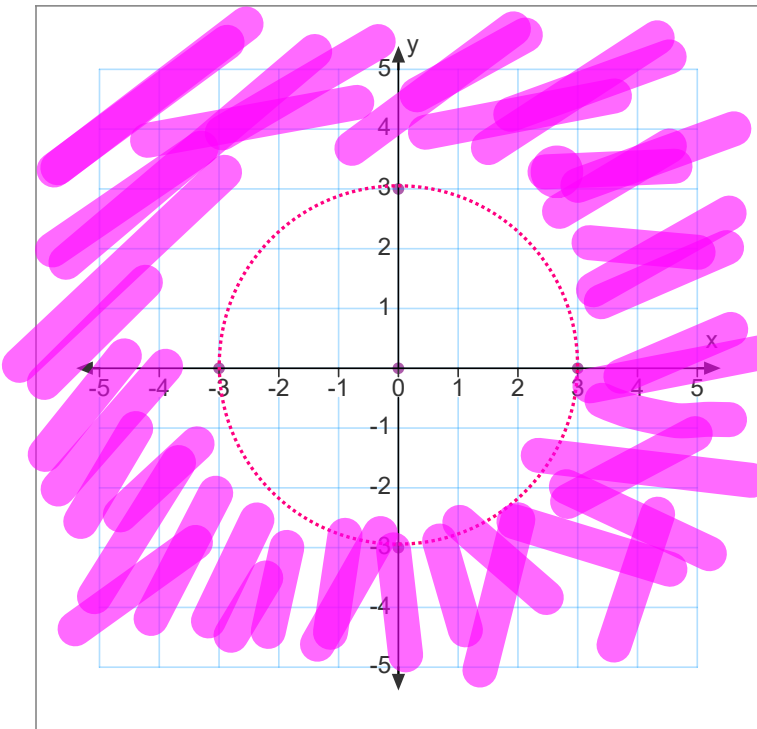
$$(-1)^2 + (-2)^2 \leq 4$$

$$1 + 4 \leq 4$$

$$5 \leq 4 \text{ False}$$

\therefore shade inside

Example: Draw the solution set of $x^2 + y^2 > 9$.



$$\textcircled{1} \quad x^2 + y^2 = 9$$

$$c(0,0) \quad r=3$$

$>$ dotted

$\textcircled{2}$ shading
Test $(0,0)$ Inside

$$x^2 + y^2 > 9$$

$$0^2 + 0^2 > 9$$

$0 > 9$ False

\therefore shading is outside

Summary

$$(x-h)^2 + (y-k)^2 \leq r^2 \longrightarrow \text{●}$$

$$(x-h)^2 + (y-k)^2 < r^2 \longrightarrow \text{○}$$

$$(x-h)^2 + (y-k)^2 \geq r^2 \longrightarrow \text{■}$$

$$(x-h)^2 + (y-k)^2 > r^2 \longrightarrow \text{□}$$

W.B

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7, 8, 12, 14, 18,

19, 20