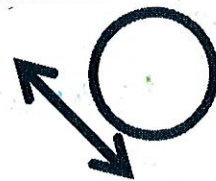


SOLVING SIMPLE INTERSECTIONS

Lines and Circles

A Circle and Line May:

★ Never Intersect



★ 1 Point of Intersection



★ 2 Points of Intersection



Solve by Substitution → System of Equations

3. Solve Algebraically

$$x^2 + y^2 = 34$$

$$x - y = 2$$

Isolate one variable

$$x = y + 2$$

$$x = -5 + 2 \quad | \quad x = 3 + 2$$

$$x = -3 \quad | \quad x = 5$$

$$(-3, -5) \quad (5, 3)$$

(x, y)

Substitute in for x

$$(y + 2)^2 + y^2 = 34$$

$$(y + 2)(y + 2) + y^2 = 34$$

$$y^2 + 4y + 4 + y^2 = 34$$

$$2y^2 + 4y - 30 = 0 \rightarrow \text{combined like terms}$$

$$2(y^2 + 2y - 15) = 0 \rightarrow \text{factor out GCF}$$

$$2(y + 5)(y - 3) = 0$$

$$y = -5 \text{ and } y = 3 \quad * \text{ SOLUTIONS}$$

Substitute to find x values

4. Solve Algebraically

$$x^2 + y^2 = 10$$

$$x + 3y = 10$$

Solve for 1 variable

$$x = -3y + 10$$

$$x = -3(3) + 10$$

$$x = 1$$

$$(1, 3)$$

Substitute for x

$$(-3y + 10)^2 + y^2 = 10$$

$$(-3y + 10)(-3y + 10) + y^2 = 10$$

$$9y^2 - 60y + 100 + y^2 = 10$$

$$10y^2 - 60y + 90 = 0 \quad \text{COMBINE LIKE TERMS}$$

$$10(y^2 - 6y + 9) = 0 \quad \text{GCF}$$

$$10(y - 3)(y - 3) = 0 \quad \text{FACTOR}$$

$$y = 3 \quad * \text{ SOLUTIONS}$$

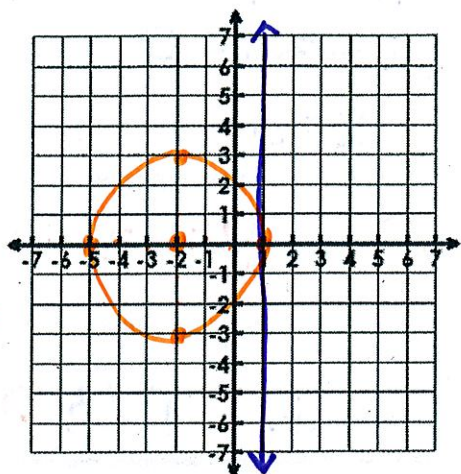
Substitute to find x

Name: _____ Date: _____

Intersections of Circles & Lines - Homework

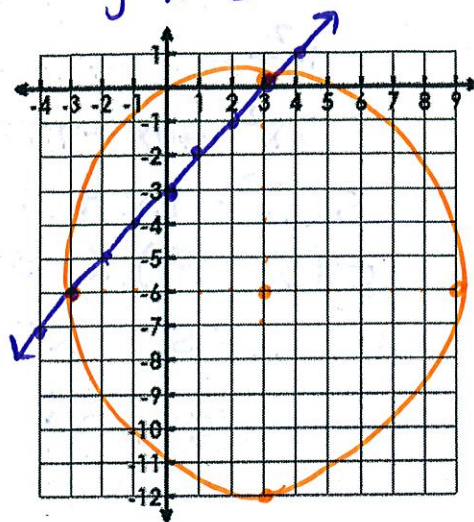
Solve by graphing and find the point(s) of intersection. If there are none, write "none."

1. $(x+2)^2 + y^2 = 9$ $C: (-2, 0)$ $r: 3$
 $x = 1$



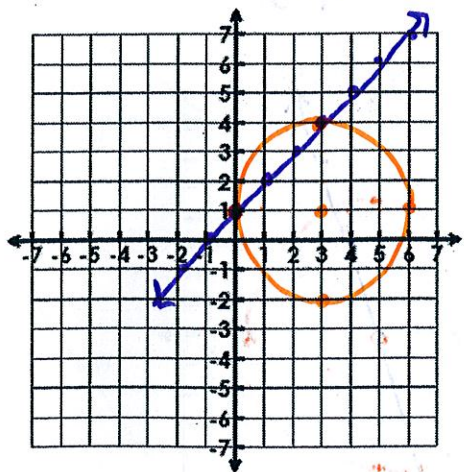
Point(s) of Intersection: (1, 0)

2. $(x-3)^2 + (y+6)^2 = 36$ $C: (3, -6)$ $r = 6$
 $y + 3 = x$ $y = x - 3$



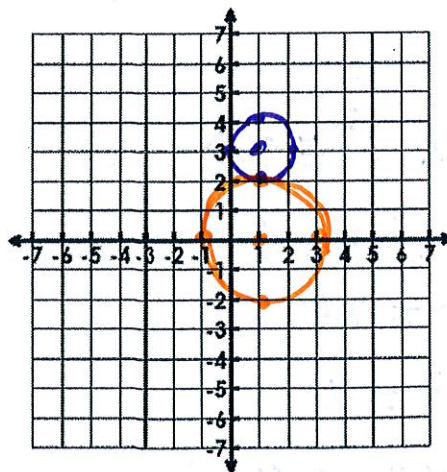
Point(s) of Intersection: (-3, -6) ; (3, 0)

3. $(x-3)^2 + (y-1)^2 = 9$ $C: (3, 1)$ $r: 3$
 $y - 1 = x$ $y = x + 1$



Point(s) of Intersection: (0, 1) ; (3, 4)

4. $(x-1)^2 + y^2 = 4$ $C: (1, 0)$ $r = 2$
 $(x-1)^2 + (y-3)^2 = 1$ $C: (1, 3)$ $r = 1$



Point(s) of Intersection: (1, 2)

Find the point(s) of intersection by solving algebraically. Show all of your work.

5. $x^2 + y^2 = 25$
 $2x + y = 10$

$x^2 + (-2x + 10)^2 = 25$

$y = -2x + 10$

$y = -10 + 10$

$y = -6 + 10$

$(-2x + 10)(-2x + 10)$

$4x^2 - 20x + 100$

$x^2 + 4x^2 - 40x + 100 = 25$

$5x^2 - 40x + 75 = 0$

$5(x^2 - 8x + 15) = 0$

$5(x - 5)(x - 3) = 0$

$x = 5 \quad x = 3$

6. $x^2 + y^2 = 9$
 $x + y = 3$

$x^2 + (-x + 3)^2 = 9$

$y = -x + 3$

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

$2x^2 - 6x = 0$

$2x(x - 3) = 0$

$x = 0 \quad x = 3$

$y = -0 + 3$

$y = -3 + 3$

Point(s) of Intersection: $(5, 0); (3, 4)$

Point(s) of Intersection: $(0, 3); (3, 0)$

Word Problem

7. A circle is centered at the origin and has a radius of $(2\sqrt{5})^2$ units. A line with a slope of 3 passes through the origin and intersects the circle in two places. Where does the line intersect the circle?

Write the equation of the circle: $x^2 + y^2 = 20$

$(2\sqrt{5})(2\sqrt{5})$

$4\sqrt{25}$

$4 \cdot 5$

Write the equation of the line: $y = 3x$

Find solutions algebraically

$x^2 + (3x)^2 = 20$

$x^2 + 9x^2 = 20$

$10x^2 = 20$

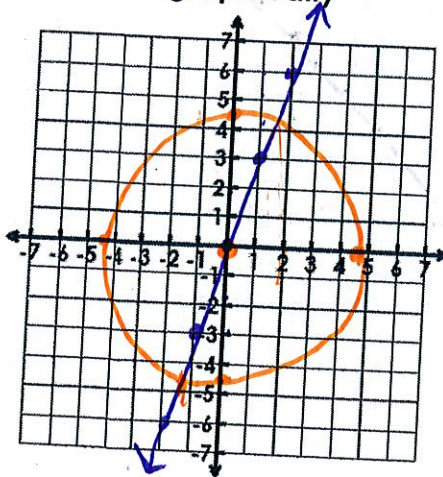
$x^2 = 2$

$x = \pm\sqrt{2} \approx \pm 1.4$

Point(s) of Intersection: $(\pm\sqrt{2}, \pm 3\sqrt{2})$

$(1.4, 4.2)$

Find solutions graphically



Point(s) of Intersection: _____