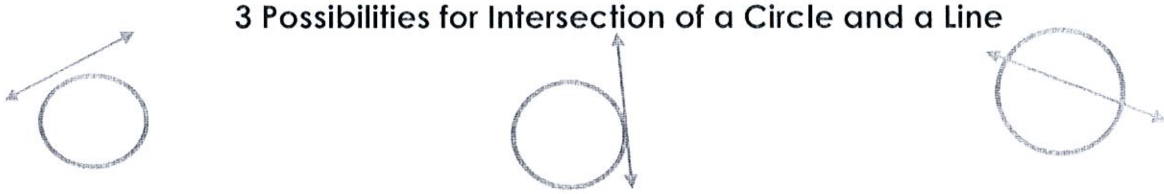
Name: ______________________ Date: ______________

Intersections of Circles & Lines – Notes

3 Possibilities for Intersection of a Circle and a Line



0 points of intersection	**1 point of intersection**	**2 points of intersection**
(no real solution)	*(one real solution)*	*(2 real solutions)*

Solve Systems Graphically:

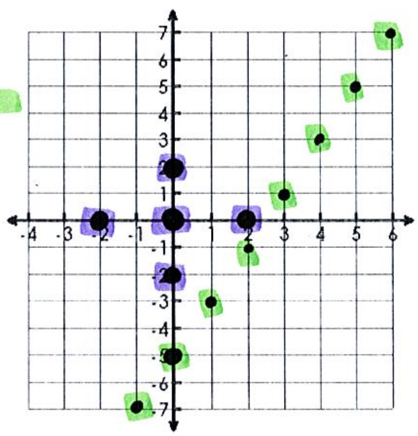
1. $x^2 + y^2 = 4 \rightarrow (0,0)\ r=2$
   $2x - y = 5$

$-y = -2x + 5$

$y = 2x - 5$

$b = -5$

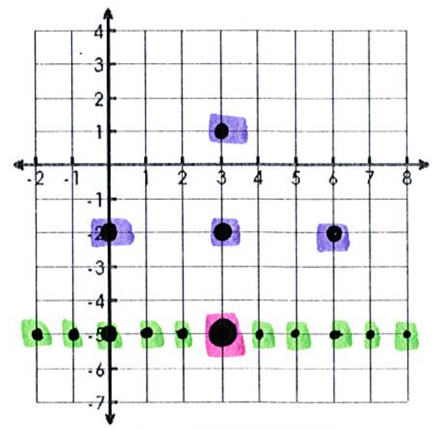
$m = \frac{2}{1}$



Point(s) of intersection: none!

2. $(x-3)^2 + (y+2)^2 = 9 \rightarrow (3,-2)\ r=3$
   $y = -5$

$\longleftrightarrow$



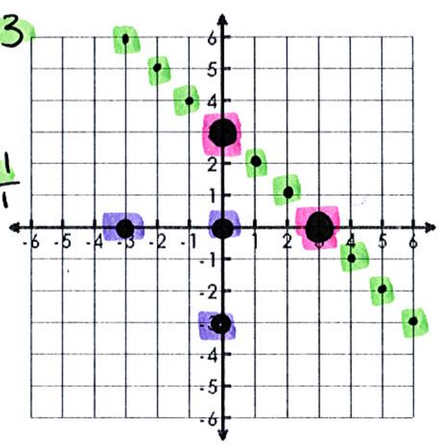
Point(s) of intersection: (3, -5)

3. $x^2 + y^2 = 9 \rightarrow (0,0)\ r=3$
   $x + y = 3$

$y = -x + 3$

$b = 3$

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



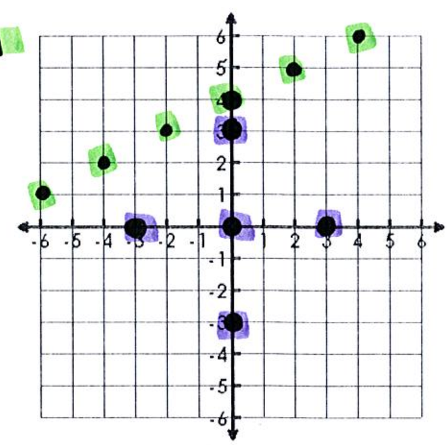
Point(s) of intersection: (0,3) + (3,0)

4. $x^2 + y^2 = 9 \rightarrow (0,0)\ r=3$
   $2y = x + 8$

$y = \frac{1}{2}x + 4$

$b = 4$

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



Point(s) of intersection: none!

Solve Algebraically:

1. Solve the linear equation for a variable.
2. Then, substitute the linear equation into the equation representing the circle.
3. Solve for a variable by using one of the methods for solving a quadratic equation.
4. Substitute the value(s) back into the linear equation to get the 2nd variable.

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5. $x^2 + y^2 = 34$
   $x - y = 2 \rightarrow x = y + 2$

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

$y^2 + 4y + 4 + y^2 - 34 = 0$

$2y^2 + 4y - 30 = 0$

$y^2 + 2y - 15 = 0$

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

$y = -5$ $y = 3$

$y = -5$: $x = y + 2$, $x = -5 + 2$, $x = -3$

$y = 3$: $x = 3 + 2$, $x = 5$

Point(s) of intersection: (5,3) & (-3,-5)

6. $x^2 + y^2 = 10$
   $x + 3y = 10 \rightarrow x = -3y + 10$

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

$9y^2 - 60y + 100 + y^2 - 10 = 0$

$10y^2 - 60y + 90 = 0$

$y^2 - 6y + 9 = 0$

$(y-3)(y-3) = 0$

$y = 3$ $y = 3$

$x = -3y + 10$

$x = -3(3) + 10$

$x = 1$

Point(s) of intersection: (1, 3)

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7. $x^2 + y^2 = 20$
   $x + 2y = 10 \rightarrow x = -2y + 10$

$(-2y+10)^2 + y^2 = 20$

$4y^2 - 40y + 100 + y^2 - 20 = 0$

$5y^2 - 40y + 80 = 0$

$y^2 - 8y + 16 = 0$

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

$y = 4$ $y = 4$

$x = -2y + 10$

$x = -2(4) + 10$

$x = 2$

Point(s) of intersection: (2, 4)

8. $x^2 + y^2 = 20$
   $y = 2$

$x^2 + 2^2 = 20$

$x^2 + 4 = 20$

$x^2 = 16$

$x = \pm 4$

Point(s) of intersection: (4,2) & (-4,2)