Solving Non Linear Systems
Practice Worksheet

Name:
Period:

Solve the system, show all work – must do one algebraically and one graphically.

1. $-x^2 + y = 12$
$x^2 - 3x - y = 0$

Elimination

$-3x = 12$
$x = -4$

(A) $-x^2 + y = 12$
$-(-4)^2 + y = 12$
$-16 + y = 12$
$+16 \quad +16$
$y = 28$

$(-4, 28)$

Note: $-(-4)^2$
$-1 \cdot -4 \cdot -4$
$-1 \cdot 16$
-16

2. $x - y = -2$
$x^2 - y^2 - 4y = 20$

Substitution

$x = y - 2$

$(y-2)^2 - y^2 - 4y = 20$
$(y-2)(y-2) - y^2 - 4y = 20$
$y^2 - 2y - 2y + 4 - y^2 - 4y = 20$
$-8y + 4 = 20$
$-4 \quad -4$
$-8y = 16$
$y = -2$

(A) $x = y - 2$
$x = (-2) - 2 = -4$
$(-4, -2)$

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

$x^2 + 2x = 6 + x^2$
$-x^2 \quad -x^2$
$2x = 6$

4. $x^3 - y^2 = 23$
$2x^3 - 3y^2 = 0$

$-2(x^3 - y^2 = 23)$
$-2x^3 + 2y^2 = -46$
$2x^3 - 3y^2 = 0$

$-y^2 = -46$
$y^2 = 46$
$y = \sqrt{46} \approx 6.8$

(A) $x^3 - (\sqrt{46})^2 = 23$
$x^3 - 46 = 23$
$+46 \quad +46$
$(x^3)^{1/3} = (69)^{1/3}$
$x = 69 \wedge (1/3)$
$x = 4.10$

$(4.10, 6.8)$
$(69^{1/3}, \sqrt{46})$

5. (A) $3x + \frac{4}{y} = 6$
(B) $x - \frac{8}{y} = -5$

$-2 \rightarrow -6x - \frac{8}{y} = -12$
$x - \frac{8}{y} = -5$

$-5x = 7$
$x = 1$

(B) $(1) - \frac{8}{y} = -5$
$-1 \quad -1$
$-\frac{8}{y} = -6$
$y \cdot -\frac{8}{y} = -6 \cdot y$
$-8 = -6y$
$-6 \quad -6$
$1.3 = y$

$(1, 1.3)$

Challenge: When you use elimination or substitution to solve for these, you will end up with a quadratic squared variable. To solve these for that first variable there is a formula below is it to solve for x, it would be the same formula if you have y^2 and are solving for y! However, there will be two solutions, so you will need to find the other coordinate variable for each! A, b, and c come from the parent function $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

6. $x^2 + y = 2$
$x^2 - 3x - y = 0$

$2x^2 - 3x = 2$

$2x^2 - 3x - 2 = 0$

$a = 2 \quad b = -3 \quad c = -2$

$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-2)}}{2(2)}$

$x = \frac{3 \pm 5}{4}$

$x = \frac{8}{4}$ & $x = \frac{3-5}{4}$

$x = 2$ $\quad x = -0.5$

(A) $(2)^2 + y = 2$ $\quad (-0.5)^2 + y = 2$

$4 + y = 2$ $\quad -0.25 + y = 2$

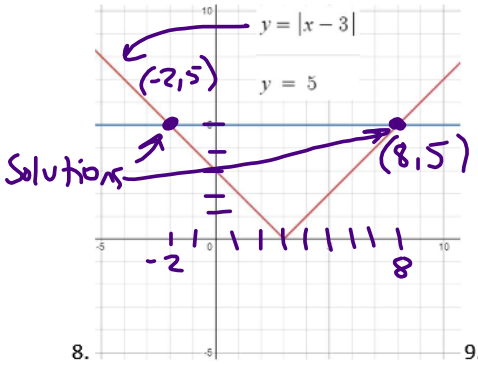
$y = -2$ $\quad y = 2.25$

$(2, -2)$ $\quad (-0.5, 2.25)$

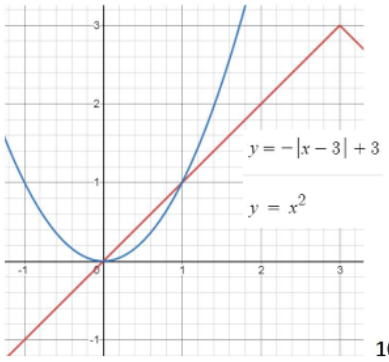
7. $x^2 + y^2 = 10$
$x^2 + 2y^2 - 7y = 0$

Must Complete: Solve these non-linear systems by graphing! The graphs are given, label the point/s of intersection.

8.



9.



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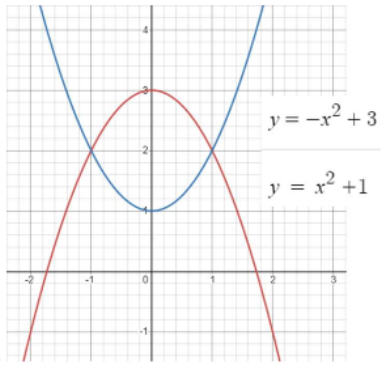

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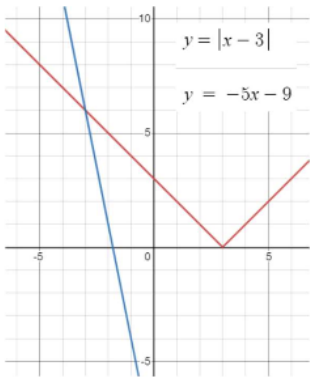

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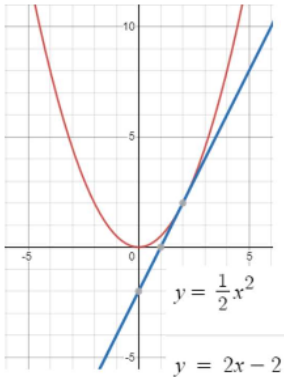

4 solutions

13. Go to desmos and graph solutions

$x^2 - y^2 = 4$

$x^2 + y^2 = 16$