Name _____ Class _____ Date _____

Practice

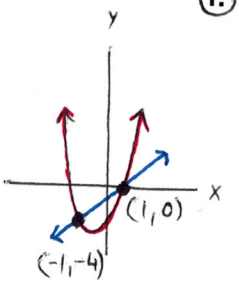
Try the rest of them :)

Form K

Quadratic Systems

Solve each system by graphing. Check your answers.

1. $\begin{cases} y = 3x^2 + 2x - 5 \\ y = 2x - 2 \end{cases}$



Algebraically:

$3x^2 + 2x - 5 = 2x - 2$

$-2x + 2 = -2x + 2$

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

$\Rightarrow x^2 = 1$

$\therefore x = 1$ or $x = -1$

when $x = 1$, $y = 2x - 2 = 2(1) - 2 = 0$ $\therefore$ (1,0)

when $x = -1$, $y = 2(-1) - 2 = -4$ $\therefore$ (-1,-4) ✓

2. $\begin{cases} y = -\frac{1}{2}x^2 - x + 3 \\ y = 3x + 14 \end{cases}$

Ans: No Solution

3. $\begin{cases} y = -x^2 + 3x - 1 \\ y = -x - 1 \end{cases}$

Ans: (0,-1) and (4,-5)

Solve each system by substitution. Check your answers.

4. $\begin{cases} y = -2x^2 + 4x - 1 \\ y = 2x - 5 \end{cases}$

$2x - 5 = -2x^2 + 4x - 1$

$+2x^2 - 4x + 1 = +2x^2 - 4x + 1$

$2x^2 - 2x - 4 = 0$

$2(x^2 - x - 2) = 0$

$2(x-2)(x+1) = 0$

$2(x-2) = 0$ or $x + 1 = 0$

$2x - 4 = 0$ $\quad x = -1$

$2x = 4$

$x = 2$

when $x = 2$, $y = 2x - 5 = 2(2) - 5 = -1$

$\therefore$ (2,-1) ✓

when $x = -1$, $y = 2(-1) - 5 = -7$

$\therefore$ (-1,-7) ✓

5. $\begin{cases} y = x^2 + 2 \\ y = -x + 4 \end{cases}$

Ans: (-2,6) and (1,3)

6. $\begin{cases} y = 6x^2 + 5x + 3 \\ y = -x + 3 \end{cases}$

Ans: (0,3) and (-1,4)

Solve each system using your graphing calculator.

7. $\begin{cases} y = x^2 - 2x + 4 \\ y = -x^2 + 2x + 4 \end{cases}$

8. $\begin{cases} y = x^2 + 3x - 2 \\ y = x^2 + 5x + 4 \end{cases}$

Ans: (-3,-2)

9. $\begin{cases} y = -x^2 + 7x - 2 \\ y = -x^2 + 3x + 2 \end{cases}$

Ans: (1,4)

Easy to solve with Nspire. Let's do algebraically.

$x^2 - 2x + 4 = -x^2 + 2x + 4$

$+x^2 - 2x - 4 = +x^2 - 2x - 4$

$2x^2 - 4x = 0$

$2x(x - 2) = 0$

$\frac{2x}{2} = \frac{0}{2}$ or $x - 2 = 0$

$x = 0$ $\quad x = 2$

when $x = 0$, $y = x^2 - 2x + 4 = 0^2 - 2(0) + 4 = 4$

$\therefore$ (0,4) ✓

when $x = 2$, $y = 2^2 - 2(2) + 4 = 4$

$\therefore$ (2,4) ✓

10. **Reasoning** What is the least number of solutions a quadratic system can have? Explain what that means.

The least # is no solution. This means the graphs of the quadratic equations don't intersect.

Name _____ Class _____ Date _____

Practice (continued)

Form K

Quadratic Systems

11. You work at a restaurant whose weekly profit is given by the formula $P = -c^2 + 14c + 800$, where c is the average price of the food, in dollars. The manager wants to add delivery service, which will cost the restaurant $D = 5c + 300$ per week.

a. Use a graphing calculator to find the highest average price c the restaurant can sell its food at and still make a profit if they add delivery.

b. What will the weekly profit P be if the restaurant sells its food at this average price and doesn't offer delivery?

c. Reasoning Even though these equations have two solutions, why is only one solution useful? (*Hint:* Remember this is a real situation.)

(12)
$-x^2+5x-2 = 3x-1$
$-3x+1 = -3x+1$
$-x^2+2x-1 = 0$
"Factor out -1"
$-1(x^2-2x+1) = 0$
$x^2-2x+1 = 0$
$(x-1)(x-1) = 0$
$(x-1)^2 = 0$
$x-1 = 0$
$x = 1$
When $x=1$,
$y = 3x-1 = 3(1)-1 = 2$

(14)
$\frac{1}{2}x^2+5x-\frac{3}{2} = x-9$
"multiply every term on both LHS & RHS of equation by 2."
$2\cdot\frac{1}{2}x^2+2\cdot5x-2\cdot\frac{3}{2} = 2\cdot x-2\cdot9$
$x^2+10x-3 = 2x-18$
$-2x+18 = -2x+18$
$x^2+8x+15 = 0$
$(x+5)(x+3) = 0$
$x = -5$ or $x = -3$
when $x=-5$, $y = x-9 = -5-9 = -14$
when $x=-3$, $y = -3-9 = -12$
$(-3,-12)$

Solve each system. When necessary, round solutions to the nearest hundredth.

12. $\begin{cases} y = -x^2 + 5x - 2 \\ y = 3x - 1 \end{cases}$
$\therefore (1,2)$ ✓

13. $\begin{cases} y = x^2 - 4x + 5 \\ y = -3x + 5 \end{cases}$
Ans: $(0,5)$ and $(1,2)$

14. $\begin{cases} y = \frac{1}{2}x^2 + 5x - \frac{3}{2} \\ y = x - 9 \end{cases}$
$\therefore (-5,-14)$ & $(-3,-12)$ ✓

15. $\begin{cases} y = x^2 + 7x - 2 \\ y = 4x - 5 \end{cases}$
No solution

16. $\begin{cases} y = -5x^2 - x + 3 \\ y = -x - 2 \end{cases}$
Ans: $(-1,-1)$ and $(1,-3)$

17. $\begin{cases} y = 2x^2 - x - 4 \\ y = x + 2 \end{cases}$
Ans: $(2.3, 4.3)$ and $(-1.3, 0.7)$

18. Error Analysis A classmate said that the quadratic system $\begin{cases} y = 2x^2 - x + 3 \\ y = -3x + 3 \end{cases}$ has no solutions. Her work is below. What mistake did she make? What is the solution of this system?

(16)
$-5x^2-x+3 = -x-2$
$+5x^2+x+3 = 5x^2+x-3$
$0 = 5x^2 - 5$
$5 = 5x^2$
$1 = x^2$
$\pm 1 = x$
When $x=1$, $y = -x-2 = -1-2 = -3$
$\therefore (1,-3)$ ✓
When $x=-1$, $y = -(-1)-2 = -1$
$\therefore (-1,-1)$ ✓

$2x^2 - x + 3 = -3x + 3$
$2x^2 + 2x + 6 = 0$ ← Here
$x^2 + x + 3 = 0$
$\frac{-1 \pm \sqrt{1^2 - (4)(1)(3)}}{2(1)}$
$\frac{-1 \pm \sqrt{-11}}{2}$

Her mistake is in the second step. She needed to subtract 3 to both sides of the equation. So, we should have:

$2x^2 + 2x = 0$
$2x(x+1) = 0$
$2x = 0$ or $x+1 = 0$
$x = 0$ or $x = -1$
$\therefore (0,3)$ ✓ and $(-1,6)$ ✓