

Name: key
Algebra 1

Date: _____
Band: _____

Unit 9: Quadratic Functions & Equations Study Guide

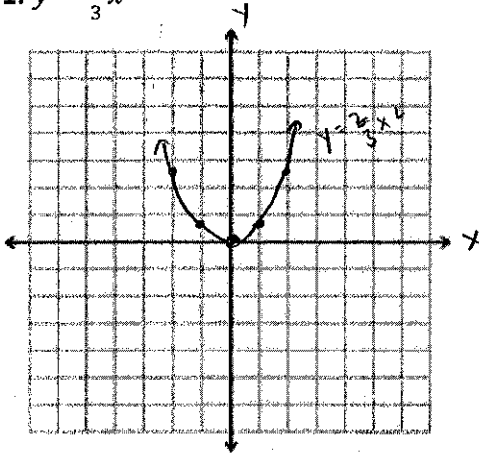
LT#1: Graph quadratic functions of the form $y = ax^2$ and $y = ax^2 + c$.

LT#2: Graph quadratic functions of the form $y = ax^2 + bx + c$.

Graph each function. Label the axis of symmetry and the vertex.

1. $y = \frac{2}{3}x^2$

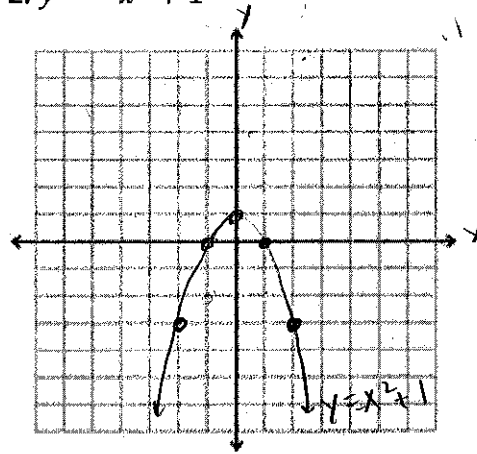
x	y
-2	$\frac{8}{3}$
-1	$\frac{2}{3}$
0	0
1	$\frac{2}{3}$
2	$\frac{8}{3}$



vertex: $(0,0)$

axis of symmetry: $x=0$

2. $y = -x^2 + 1$



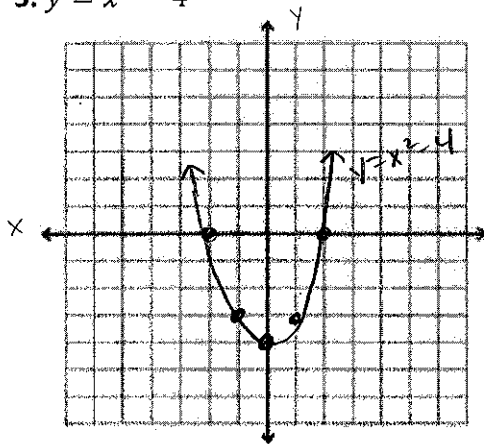
vertex: $(0,1)$

axis of symmetry: $x=0$

x	y
-2	-3
-1	0
0	1
1	0
2	-3

3. $y = x^2 - 4$

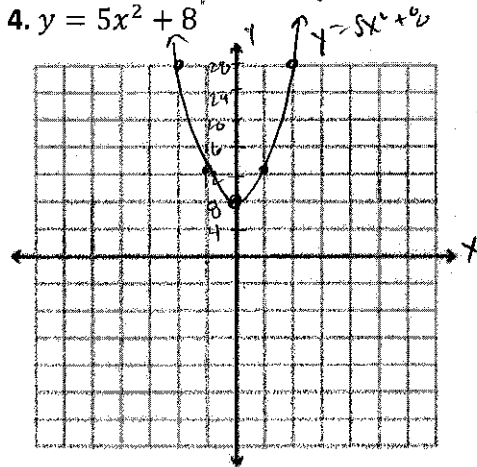
x	y
-2	0
-1	-3
0	-4
1	-3
2	0



vertex: $(0,-4)$

axis of symmetry: $x=0$

4. $y = 5x^2 + 8$



vertex: $(0,8)$

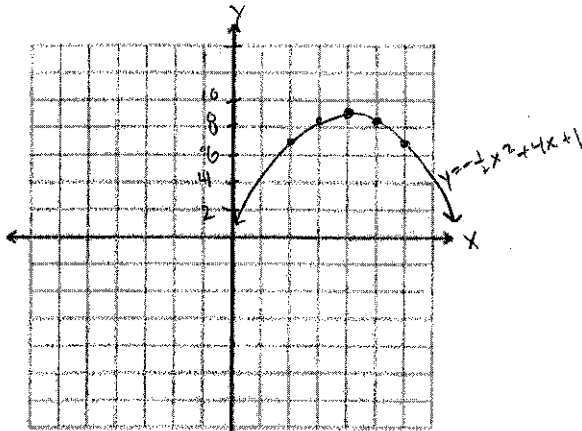
axis of symmetry: $x=0$

x	y
-2	28
-1	13
0	8
1	13
2	28

Unit 9: Quadratic Functions and Equations Study Guide

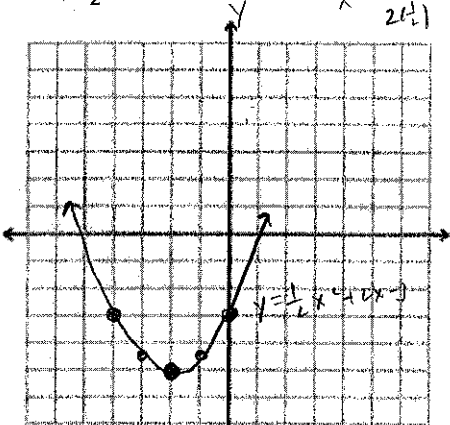
5. $y = -\frac{1}{2}x^2 + 4x + 1$ $x = \frac{-4}{2(-\frac{1}{2})} = \frac{-4}{-1} = 4$

x	y
2	7
3	$8\frac{1}{2}$
4	9
5	$8\frac{1}{2}$
6	7



vertex: (4, 9)
axis of symmetry: $x = 4$
7. $y = \frac{1}{2}x^2 + 2x - 3$ $x = \frac{-2}{2(\frac{1}{2})} = \frac{-2}{1} = -2$

x	y
-4	-3
-3	-4.5
-2	-5
-1	-4.5
0	-3



vertex: (-2, -5) axis of symmetry: $x = -2$

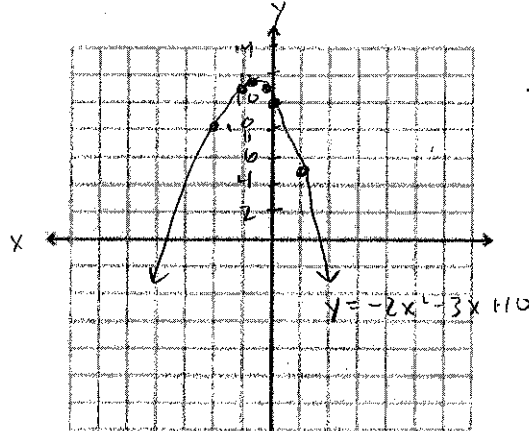
Given an example of a quadratic function that matches each description.

9. Its graph opens downward

$y = -x^2$

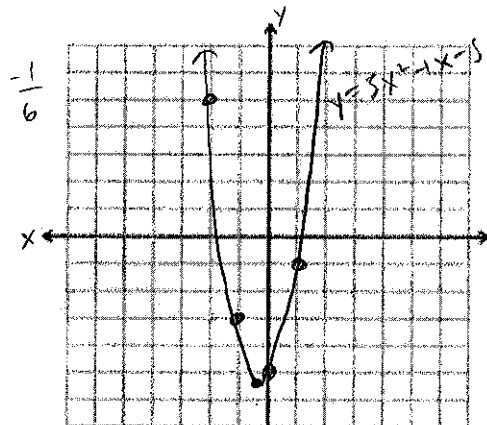
6. $y = -2x^2 - 3x + 10$ $x = \frac{-(-3)}{2(-2)} = \frac{3}{-4}$

x	y
-2	8
-1	11
$-3/4$	11.125
0	10
1	5



vertex: $(-\frac{3}{4}, 11.125)$
axis of symmetry: $x = -\frac{3}{4}$
8. $y = 3x^2 + x - 5$ $x = \frac{-1}{2(3)} = \frac{-1}{6}$

x	y
-2	-5
-1	-3
$-1/6$	$-5.08\bar{3}$
0	-5
1	-1



vertex: $(-\frac{1}{6}, -5.08\bar{3})$ axis of symmetry: $x = -\frac{1}{6}$

10. The vertex of its graph is at the origin

$y = x^2$

11. Its graph opens upward

$y = x^2$

12. Its graph is wider than the graph of $y = x^2$

$y = \frac{1}{2}x^2$

LT#3: Solve quadratic equations by graphing and using square roots.

Solve each equation. If the equation has no real-number solution, write no solution.

13. $\frac{6(x^2 - 2)}{6} = \frac{12}{6}$

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

$x^2 = 4$

$\sqrt{x^2} = \sqrt{4}$

$x = 2, x = -2$

16. $3r^2 + 27 = 0$
-27 -27

$\frac{3r^2}{3} = \frac{-27}{3}$

$r^2 = -9$

no solution

14. $\frac{-5m^2}{-5} = \frac{-125}{-5}$

$m^2 = 25$

$\sqrt{m^2} = \sqrt{25}$

$m = 5, m = -5$

15. $\frac{9(w^2 + 1)}{9} = \frac{9}{9}$

$w^2 + 1 = 1$
-1 -1

$\sqrt{w^2} = \sqrt{0}$

$w = 0$

18. $\frac{4n^2}{4} = \frac{64}{4}$

$n^2 = 16$

$\sqrt{n^2} = \sqrt{16}$

$n = 4, n = -4$

LT#4: Solve quadratic equations by factoring.

Solve by factoring.

19. $x^2 + 7x + 12 = 0$

$(x + 4)(x + 3) = 0$

$x + 4 = 0$ $x + 3 = 0$

-4 -4 -3 -3

$x = -4, x = -3$

20. $5x^2 - 10x = 0$

$5x(x - 2) = 0$

$5x = 0$ $x - 2 = 0$

$\frac{5}{5} \frac{x}{5}$ +2 +2

$x = 0, x = 2$

21. $2x^2 - 9x = x^2 - 20$

$-x^2 + 2x - x^2 + 20$

$x^2 - 9x + 20 = 0$

$(x - 5)(x - 4) = 0$

$x - 5 = 0$ $x - 4 = 0$

+5 +5 +4 +4

$x = 5, x = 4$

22. $2x^2 + 5x = 3$

-3 -3

$2x^2 + 5x - 3 = 0$

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

$2x(x + 3) - 1(x + 3) = 0$

$(2x - 1)(x + 3) = 0$

$2x - 1 = 0$ $x + 3 = 0$

+1 +1 -3 -3

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

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

$x = -3$

23. $3x^2 - 5x = -3x^2 + 6$

+3x^2 -6 +3x^2 -6

$6x^2 - 5x - 6 = 0$

$6x^2 - 9x + 4x - 6 = 0$

$3x(2x - 3) + 2(2x - 3) = 0$

$(3x + 2)(2x - 3) = 0$

$3x + 2 = 0$ $2x - 3 = 0$

-2 -2

$\frac{3x}{3} = \frac{-2}{3}$

$x = -\frac{2}{3}$

+3 +3

$\frac{2x}{2} = \frac{3}{2}$

$x = \frac{3}{2}$

24. $x^2 - 5x + 4 = 0$

$(x - 4)(x - 1) = 0$

$x - 4 = 0$ $x - 1 = 0$

+4 +4 +1 +1

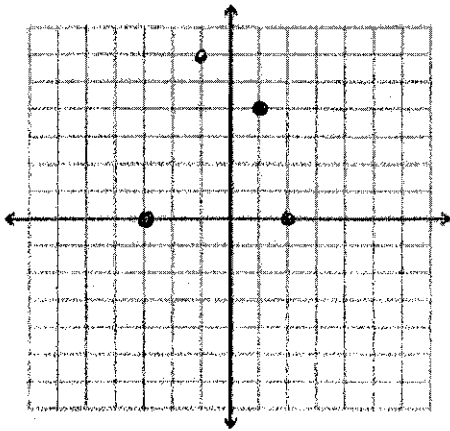
$x = 4, x = 1$

LT#5: Choose a linear, quadratic, or exponential model for data.

Graph each set of points. Which model is most appropriate for each data set.

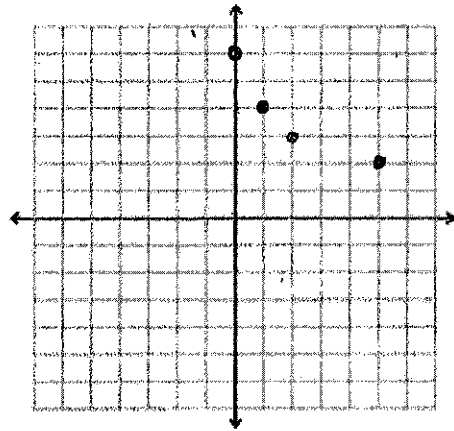
25. $(-3,0), (1,4), (-1,6), (2,0)$

26. $(0,6), (5,2), (1,4), (8,1.5), (2,3)$



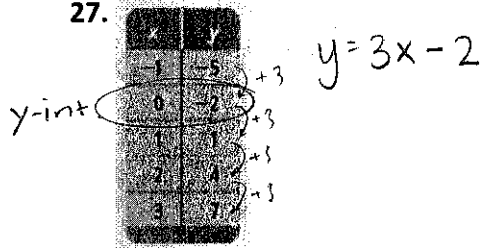
quadratic

Write an equation to model the data.

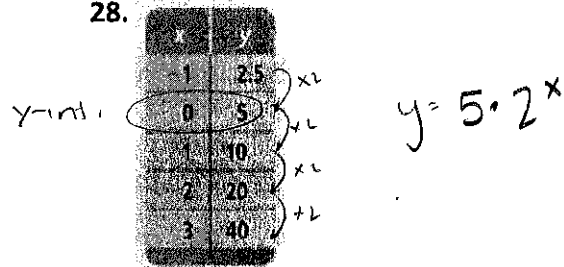


exponential

27.



28.

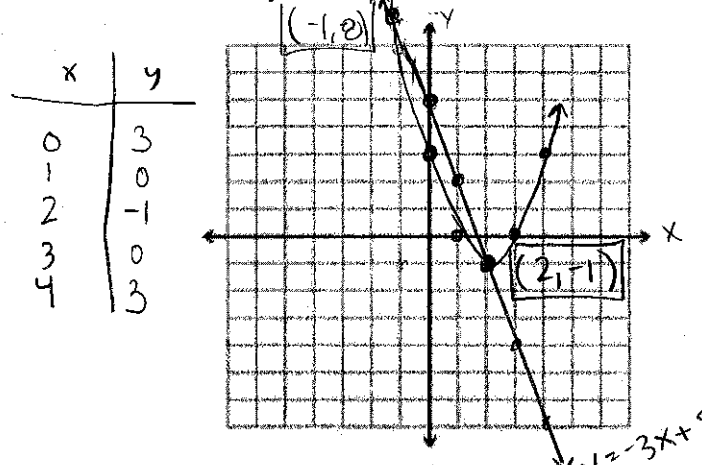


LT#6: Solve systems of linear and quadratic equations.

Solve each system by graphing.

$x = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$

29. $y = x^2 - 4x + 3$
 $y = -3x + 5$

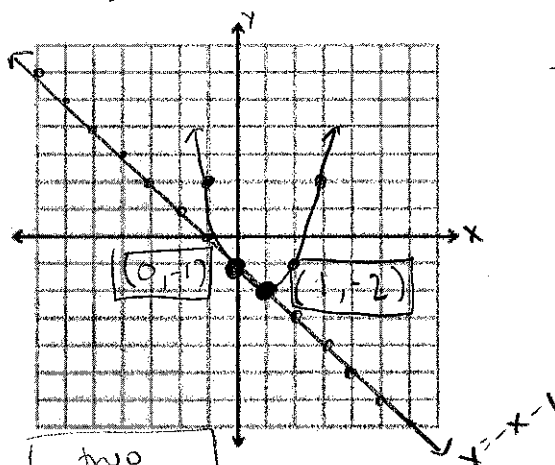


x	y
0	3
1	0
2	-1
3	0
4	3

two solutions:
 $(2, -1)$
 $(-1, 8)$

30. $y = x^2 - 2x - 1$
 $y = -x - 1$

$x = \frac{-(-2)}{2(1)} = \frac{2}{2} = 1$



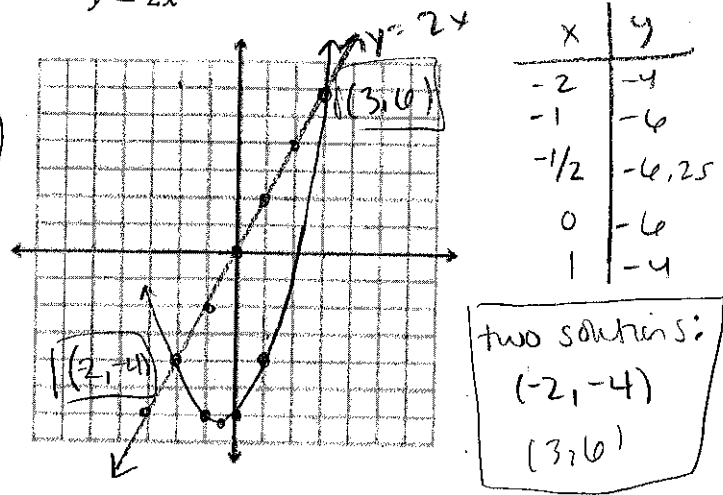
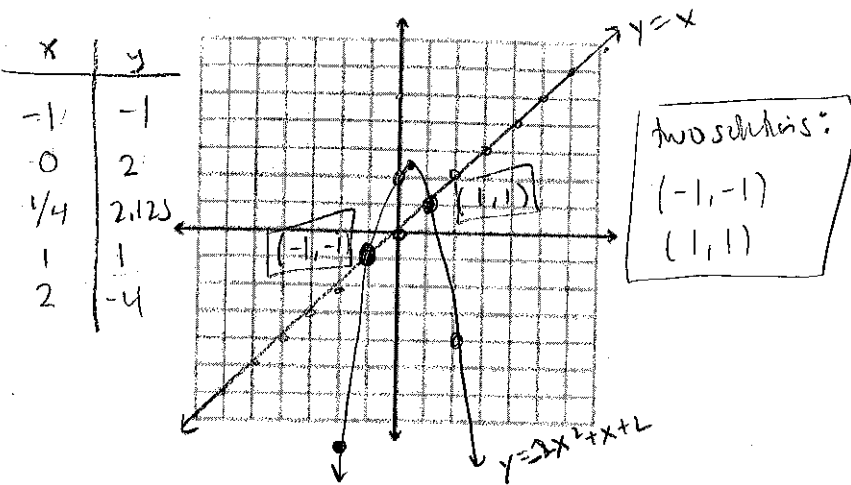
x	y
-1	2
0	-1
1	-2
2	-1
3	2

two solutions:
 $(0, -1)$
 $(1, -2)$

Unit 9: Quadratic Functions and Equations Study Guide

31. $y = -2x^2 + x + 2$
 $y = x$
 $x = \frac{-1}{2(-2)} = \frac{-1}{-4} = \frac{1}{4}$

32. $y = x^2 + x - 6$
 $y = 2x$
 $x = \frac{-1}{2(1)} = \frac{-1}{2}$



Solve each system algebraically.

33. $y = x^2 + 2x - 45$
 $y = 6x + 51$
 $y = 6(12) + 51$
 $y = 123$
 $x^2 + 2x - 45 = 6x + 51$
 $-6x - 51 - 6x - 51$
 $x^2 - 4x - 96 = 0$
 $(x - 12)(x + 8) = 0$
 $x - 12 = 0$ $x + 8 = 0$
 $+12$ -8
 $x = 12$ $x = -8$
 $y = 6(-8) + 51$
 $y = 3$
 $(-8, 3)$

34. $y = x^2 - 12x + 33$
 $y = 4x - 30$
 $y = 4(9) - 30$
 $y = 6$
 $x^2 - 12x + 33 = 4x - 30$
 $-4x + 30 - 4x + 30$
 $x^2 - 16x + 63 = 0$
 $(x - 9)(x - 7) = 0$
 $x - 9 = 0$ $x - 7 = 0$
 $+9$ $+7$
 $x = 9$ $x = 7$
 $y = 4(9) - 30$
 $y = 6$
 $(9, 6)$
 $y = 4(7) - 30$
 $y = -2$
 $(7, -2)$

35. $y = x^2 + 19x + 39$
 $y - 11 = 8x$
 $y = 8x + 11$
 $y = 8(-7) + 11$
 $y = -45$
 $x^2 + 19x + 39 = 8x + 11$
 $-8x - 11 - 8x - 11$
 $x^2 + 11x + 28 = 0$
 $(x + 7)(x + 4) = 0$
 $x + 7 = 0$ $x + 4 = 0$
 -7 -4
 $x = -7$ $x = -4$
 $y = 8(-4) + 11$
 $y = -21$
 $(-4, -21)$

36. $y = x^2 + 5x - 40$
 $y + 1 = -5x$
 $y = -5x - 1$
 $y = -5(-13) - 1$
 $y = 64$
 $x^2 + 5x - 40 = -5x - 1$
 $+5x + 1 + 5x + 1$
 $x^2 + 10x - 39 = 0$
 $(x + 13)(x - 3) = 0$
 $x + 13 = 0$ $x - 3 = 0$
 -13 $+3$
 $x = -13$ $x = 3$
 $y = -5(-13) - 1$
 $y = 64$
 $(-13, 64)$
 $y = -5(3) - 1$
 $y = -16$
 $(3, -16)$

37. $y = x^2 + 3x + 15$
 $y + 45 = 19x$
 $-45 \quad -45$
 $y = 19x - 45$

$$\begin{array}{r} x^2 + 3x + 15 = 19x - 45 \\ -19x + 45 \quad -19x + 45 \\ \hline \end{array}$$

$$x^2 - 16x + 60 = 0$$

$$(x - 10)(x - 6) = 0$$

$$x - 10 = 0$$

$$\begin{array}{r} +10 \quad +10 \\ \hline \end{array}$$

$$x = 10$$

$$x - 6 = 0$$

$$\begin{array}{r} +6 \quad +6 \\ \hline \end{array}$$

$$x = 6$$

$$y = 19(10) - 45$$

$$y = 145$$

$$\boxed{(10, 145)}$$

$$y = 19(6) - 45$$

$$y = 69$$

$$\boxed{(6, 69)}$$

38. $y = x^2 + 11x + 51$
 $y = -10x - 57$

$$\begin{array}{r} x^2 + (11x + 51) = -10x - 57 \\ +10x + 57 \quad +10x + 57 \\ \hline \end{array}$$

$$x^2 + 21x + 108 = 0$$

$$(x + 12)(x + 9) = 0$$

$$x + 12 = 0 \quad x + 9 = 0$$

$$\begin{array}{r} -12 \quad -12 \\ \hline \end{array}$$

$$x = 12$$

$$\begin{array}{r} -9 \quad -9 \\ \hline \end{array}$$

$$x = 9$$

$$y = -10(12) - 57$$

$$y = -177$$

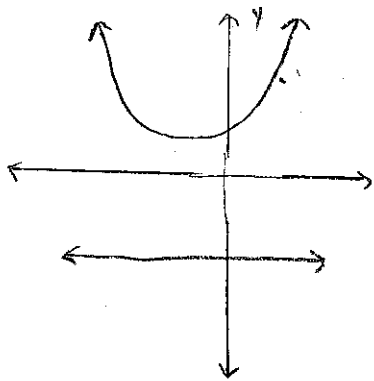
$$\boxed{(12, -177)}$$

$$y = -10(9) - 57$$

$$y = -147$$

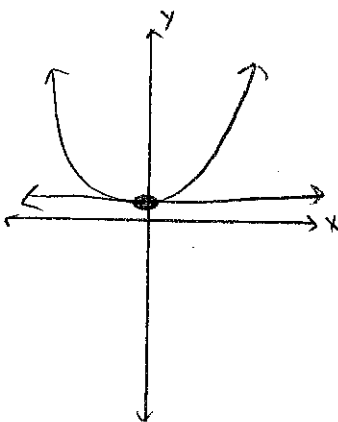
$$\boxed{(9, -147)}$$

39. Explain how you can use graphing to determine the number of solutions of a system of linear and quadratic equations.



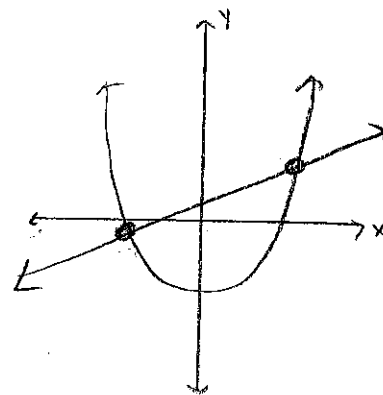
no solution

(no intersection points)



one solution

(one intersection point)



two solutions

(two intersection points)