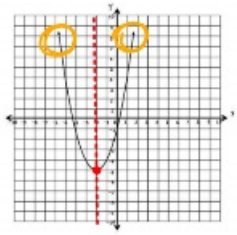
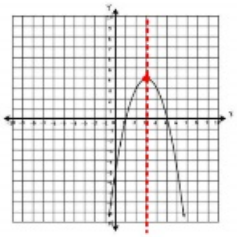
Analyzing Quadratic Graphs

GRAPH A



GRAPH B



Answer the questions given the graphs above.

1. *What is the* ***axis of symmetry*** *for* ***Graph A****?* $x=-2$

2. *What is the* ***axis of symmetry*** *for* ***Graph B****?* $x=3$

3. *What is the* ***vertex*** *of* ***Graph A****?* $(-2,-5)$ ***Maximum*** *or* ***Minimum****?* min.

4. *What is the* ***vertex*** *of* ***Graph B****?* $(3,4)$ ***Maximum*** *or* ***Minimum****?* max.

x-values y-values

5. *Identify the* ***domain*** *and* ***range*** *of* ***Graph A****.*

D: $-\infty \le x \le \infty$ all real #s

R: $y \ge -5$

6. *Identify the* ***domain*** *and* ***range*** *of* ***Graph B****.*

D: all real #s

R: $y \le 4$

WRONG AOS

7. *Identify the* ***equation*** *for* ***Graph A****:* up a^+

~~**A.** $y = x^2 - 4x - 1$~~ a^-

B. $y = x^2 + 4x - 1$

~~**C.** $y = -x^2 - 4x - 1$~~

~~**D.** $y = -x^2 + 4x - 1$~~ a^-

8. *Identify the* ***equation*** *for* ***Graph B****:* down a^-

~~**A.** $y = x^2 - 6x - 5$~~ a^+

~~**B.** $y = x^2 + 6x - 5$~~

~~**C.** $y = -x^2 - 6x - 5$~~

D. $y = -x^2 + 6x - 5$

#7 a) x^2-4x-1

A.O.S. $\rightarrow x=\frac{-b}{2a}$

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

$x=2$

#8 c) $y=-x^2-6x-5$

$x=\frac{6}{2(-1)}=\frac{6}{2}$

$x=-3$

9. $y = x^2 - 3$

$a=1$

$b=0$

$c=-3$ ↳ y-int!

Axis of Symmetry: $x=0$ **Vertex:** $(0,-3)$ **Sketch:**

$x=\frac{-b}{2a}$

$x=\frac{0}{2(1)}$

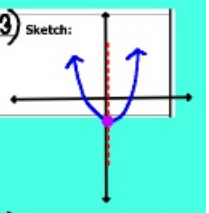
$x=0$

$y=x^2-3$

$=(0)^2-3$

$y=0-3$

$y=-3$



7. $y = -3x^2 - 24x - 42$

$a=-3$

$b=-24$

$c=-42$

Axis of Symmetry: $x=-4$ **Vertex:** $(-4,6)$ **Sketch:**

$x=\frac{-b}{2a}$

$x=\frac{24}{2(-3)}$

$x=-4$

$y=-3x^2-24x-42$

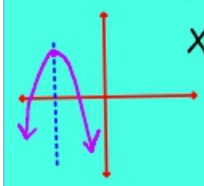
$=-3(-4)^2-24(-4)-42$

$y=-3(16)+96-42$

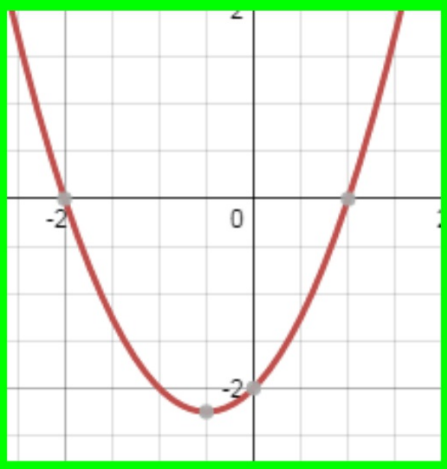
$y=-48+96-42$

$y=48-42$

$y=6$



Example: What is the equation of the graph below?



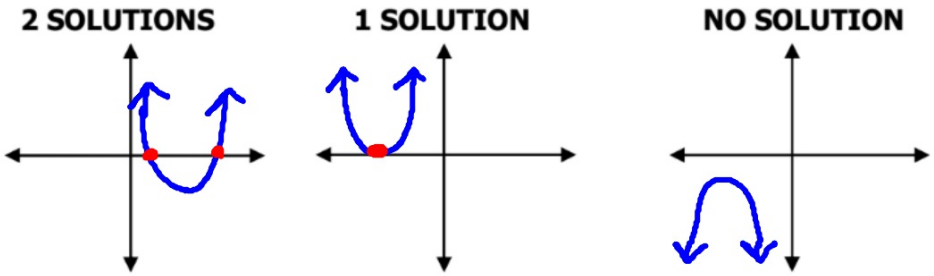
A. $y = -x^2 - 2x + 2$

B. $y = x^2 - x - 2$

C. $y = x^2 + x + 2$

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

Topic: Identifying Quadratics Roots	Date:

Main Ideas/Questions	Notes
Definition	The location(s) where the parabola crosses the x- axis
Also called...	x-intercepts, zeros, solutions
Number of Solutions	

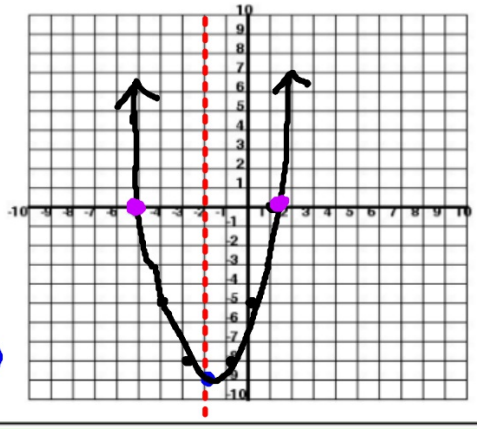
1. $y = x^2 + 4x - 5$

AOS = $x = -2$

Vertex = $(-2, -9)$

Solutions: { -5, 1}

x	y
-5	0
-4	-5
-3	-8
-2	-9
-1	-8
0	-5
1	0



Look for values of x when y = 0.

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

$a=1 \quad b=-2 \quad c=1$

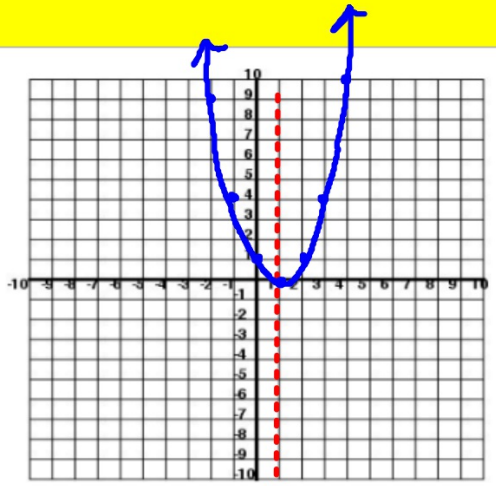
AOS = $x=1$

Vertex = $(1,0)$

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

x-int.

x	y
-2	9
-1	4
0	1
1	0
2	1
3	4
4	9



$y=(1)^2-2(1)+1$

Solutions: {1}

Look for values of x when y = 0.

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

$a = -1 \quad b = 2 \quad c = -3$

AOS = $x = 1$

Vertex = $(1, -2)$

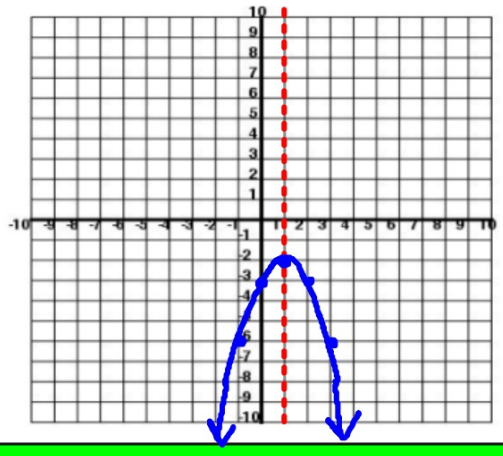
$$x = \frac{-b}{2a} = \frac{-2}{2(-1)}$$

$x = 1$

$y = -(1)^2 + 2(1) - 3$

$= -1 + 2 - 3$

x	y
-2	-11
-1	-6
0	-3
1	-2
2	-3
3	-6
4	-11



No real roots.

Look for values of x when y = 0

The Discriminant	Used to determine the number of solutions.
	Formula: $d = b^2 - 4ac$ ***If d > 0, then there are*** 2 ***solutions.*** ***If d = 0, then there are*** 1 ***solutions.*** ***If d < 0, then there are*** 0 ***solutions.***

7. $y = x^2 + 5x + 4$ $a=1 \quad b=5 \quad c=4$ $d=(5)^2-4(1)(4)$ $d=9$ 2 sol.	**8.** $y = x^2 - 3x + 10$ $a=1 \quad b=-3 \quad c=10$ $d=(-3)^2-4(1)(10)$ $d=-31$ 0 sol.
9. $y = x^2 + 10x + 25$ $a=1 \quad b=10 \quad c=25$ $d=(10)^2-4(1)(25)$ $d=0$ 1 sol.	**10.** $y = 2x^2 - 4x - 3$
11. $y = 4x^2 - 12x + 9$	**12.** $y = -3x^2 + 5x - 8$

Graphing v. Factoring

Graphing:

The equation needs to be in the form:

$$y=ax^2+bx + c$$

Graph the equation and identify the <u>roots</u>, aka the <u>x-intercepts</u>, or the <u>zeroes</u>.

Factoring:

The equation needs to be in the form:

$$ax^2 + bx + c = 0$$

Factor completely and then set each factor equal to 0. Solve each equation for x.

Main Ideas/Questions	Notes/Examples
SOLVING QUADRATICS By Factoring	In many cases, we can find the solutions (or roots, zeros, x-intercepts) of a quadratic equation by factoring, rather than graphing. Follow the steps below to find the solutions of the given equation by factoring.

❶	Set the quadratic equation equal to 0.
❷	Factor the left side.
❸	Set each factor equal to 0 and solve each factor for x.
❹	Write your answer using curly braces.

Given: $y = x^2 + 3x - 10$

$x^2+3x-10=0$

$a=1 \quad b=3 \quad c=-10$

$ac=-10$

1	−10
2	−5
−1	10
−2	5

$(x-2)(x+5)=0$

$x-2=0 \quad x+5=0$

$+2 \; +2 \quad -5 \; -5$

$x=2 \quad x=-5$

$\{-5, 2\}$

1. $x^2 + 4x + 3 = 0$

$a=1 \quad b=4 \quad c=3$

$ac=3$

1	3

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

$x(x+1)+3(x+1)$

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

$x+3=0 \quad x+1=0$

$-3 \; -3 \quad -1 \; -1$

$x=-3 \quad x=-1$

$\{-3, -1\}$

2. $x^2 + 11x + 24 = 0$

$a=1 \quad b=11 \quad c=24$

$ac=24$

1	24
2	12
3	8
4	6

$(x+3)(x+8)=0$

$x+3=0 \quad x+8=0$

$-3 \; -3 \quad -8 \; -8$

$x=-3 \quad x=-8$

$\{-8, -3\}$

5. $x^2 - 10x + 21 = 0$

$a=1 \quad b=-10 \quad c=21$

$ac=21$

1	21
−3	−7

$\{3, 7\}$

$(x-3)(x-7)=0$

$x-3=0 \quad x-7=0$

$+3 \; +3 \quad +7 \; +7$

$x=3 \quad x=7$

6. $x^2 - x - 20 = 0$

$\{-4, 5\}$

9. $x^2 - 8x = 0$

$\frac{x^2}{x} \quad \frac{8x}{x}$

$\boxed{x}\boxed{(x-8)} = 0$

$\{0, 8\}$

$x = 0 \qquad x - 8 = 0$

$\quad +8 \; +8$

$x = 8$

10. $3x^2 + 15x = 0$

$\frac{3x^2}{3x} \quad \frac{15x}{3x}$

$\boxed{3x}\boxed{(x+5)} = 0$

$\{-5, 0\}$

$\frac{3x}{3} = \frac{0}{3} \qquad x + 5 = 0$

$x = 0 \qquad -5 \; -5$

$x = -5$

13. $x^2 - 64 = 0$

$(x+8)(x-8) = 0$

$x + 8 = 0 \qquad x - 8 = 0$

$-8 \; -8 \qquad +8 \; +8$

$x = -8 \qquad x = 8$

$\{-8, 8\}$

14. $x^2 - 25 = 0$

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

$x + 5 = 0 \qquad x - 5 = 0$

$-5 \; -5 \qquad +5 \; +5$

$x = -5 \qquad x = 5$

$\{-5, 5\}$

EQUATIONS NOT IN

Standard Form

MOVE ➖ FACTOR ➖ SOLVE!

17. $x^2 + 4x = 21$

$-21 \quad -21$

$x^2 + 4x - 21 = 0$

18. $x^2 - 45 = 4x$

$-4x \quad -4x$

$x^2 - 4x - 45 = 0$

21. $11x^2 = x^2 + 8x$

$-x^2 \quad -x^2$

$10x^2 = 8x$

$-8x \quad -8x$

$10x^2 - 8x = 0$

22. $16x^2 = 9$

$-9 \quad -9$

$16x^2 - 9 = 0$

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

$4x + 3 = 0 \qquad 4x - 3 = 0$

$-3 \quad -3 \qquad +3 \quad +3$

$\frac{4x}{4} = \frac{-3}{4} \qquad \frac{4x}{4} = \frac{3}{4}$

$x = \frac{-3}{4} \qquad x = \frac{3}{4}$

$\left\{ \frac{-3}{4}, \frac{3}{4} \right\}$