

Quadratic Forms Maze

Name _____ Date _____ Hour _____

Algebra 2 ~ 2.1 Maze (BIM) Transformations of Quadratic Functions (TOR)

Essential Question: How do constants a , h & k impact quadratic function graph $g(x) = a(x-h)^2 + k$?

Goals: 1) Describe transformations of quadratic functions, 2) Write transformations of quadratic functions, 3) apply

DIRECTIONS FOR SHOWING WORK

On the back, write each equation you have used and EXPLAIN how it is transformed and key features seen on graph. (ex: Vertex, Reflection, Axis of Symmetry, X-intercepts)

Transformation of Quadratic Function Maze

Directions: Write the quadratic function, that is obtained from the parent function $y = x^2$ modeling each graph. Use your solution to navigate through the maze. Show your work.

The maze consists of a grid of boxes. Each box contains a graph of a parabola and a corresponding quadratic equation. A path is highlighted in yellow, starting from a 'START' point at $(2, 4)$ and ending at a 'Good Job!!' sign. The path follows the following sequence of equations:

- 1) $y = -(x-3)^2 - 4$
- 2) $y = -(x-2)^2 + 4$
- 3) $y = -(x+1)^2 - 3$
- 4) $y = -(x-1)^2 + 3$
- 5) $y = -(x-1)^2 + 1$
- 6) $y = -(x+1)^2 - 1$
- 7) $y = x^2 - 6x + 6$
- 8) $y = x^2 - 6x + 11$
- 9) $y = x^2 + 4x + 1$
- 10) $y = x^2 - 2x - 4$
- 11) $y = -(x+2)^2 + 2$
- 12) $y = -(x+1)^2 + 3$

Other equations in the maze include:

- $y = (x+3)^2 - 4$
- $y = (x-2)^2 + 4$
- $y = x^2 + 2x + 4$
- $y = -x^2 - 4x - 8$
- $y = x^2 - 8x + 20$
- $y = -x^2 - 6x - 6$
- $y = x^2 - 2x + 2$
- $y = x(x+4)$
- $y = x^2 - 6x - 12$
- $y = x^2 + 4x + 1$
- $y = -(x+4)^2 - 3$
- $y = -x^2 - 8x - 14$
- $y = (x+2)(x+4)$
- $y = -(x+1)^2 - 2$
- $y = -(x+4)^2 + 3$
- $y = -(x+1)^2 + 3$

Handwritten notes include: $(2, 4)$, $(3, -4)$, and $(-2, 4)$.

<p>Equation: # 1 $y = -(x-3)^2 - 4$ $-(0-3)^2 - 4$ y-int: $(0, -13)$ Axis of Symmetry: $x = 3$ Vertex: $(3, -4)$ 'a' value: -1 X-intercepts: $x = 3 \pm 2i$</p>	<p>Equation: # 2 $y = (x+2)^2 + 4$ $(0+2)^2 + 4$ y-intercept: $(0, 8)$ Axis of Symmetry: $x = -2$ Vertex: $(-2, 4)$ 'a' value: 1 X-intercepts: $x = -2 \pm 2i$</p>	<p>Equation: # 3 $y =$ y-intercept: Axis of Symmetry: Vertex: 'a' value: X-intercepts:</p>
<p>Equation: # $y =$ y-intercept: Axis of Symmetry: Vertex: 'a' value: X-intercepts:</p>	<p>Equation: # $y =$ y-intercept: Axis of Symmetry: Vertex: 'a' value: X-intercepts:</p>	<p>Equation: # $y =$ y-intercept: Axis of Symmetry: Vertex: 'a' value: X-intercepts:</p>
<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-intercepts:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-intercepts:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-int:</p>
<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-int:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-int:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value: X-int:</p>
<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value:</p>	<p>Equation: # $y =$ y-int: A.O.S.: Vertex: 'a' value:</p>

$$\begin{aligned}
 & (\quad , 0) \\
 0 &= -(x-3)^2 - 4 \\
 +4 & \qquad \qquad +4 \\
 4 &= \frac{-1(x-3)^2}{-1} \\
 \sqrt{-4} &= \sqrt{(x-3)^2}
 \end{aligned}$$

$$\begin{aligned}
 \star \pm 2i &= x - 3 \\
 +3 & \qquad \qquad +3
 \end{aligned}$$

$$\boxed{3 \pm 2i = x}$$

$$x = 3 + 2i \text{ and } x = 3 - 2i$$

$$\begin{aligned}
 0 &= (x+2)^2 + 4 \\
 -4 & \qquad \qquad -4 \\
 \sqrt{-4} &= \sqrt{(x+2)^2} \\
 \pm 2i &= x + 2 \\
 -2 & \qquad \qquad -2 \\
 -2 \pm 2i &= x
 \end{aligned}$$

Quadratic Forms Maze

Name _____ Date _____ Hour _____

Algebra 2 ~ 2.1 Maze (BIM) Transformations of Quadratic Functions (TOR)

Essential Question: How do constants a , h & k impact quadratic function graph $g(x) = a(x-h)^2 + k$?

Goals: 1) Describe transformations of quadratic functions, 2) Write transformations of quadratic functions, 3) apply

DIRECTIONS FOR SHOWING WORK: On the back, write each equation you have used and EXPLAIN how it is transformed and key features seen on graph (ex: Vertex, Dilation, Axis of Symmetry, X-intercepts)

Transformation of Quadratic Function Maze

Directions: Write the quadratic function, that is obtained from the parent function $y = x^2$ modeling each graph. Use your solution to navigate through the maze. Show your work.

The maze contains the following quadratic functions and solutions:

- 1. $y = (x+3)^2 - 4$ (Vertex: $(-3, -4)$)
- 2. $y = -(x-2)^2 + 4$ (Vertex: $(2, 4)$)
- 3. $y = (x+2)^2 + 4$ (Vertex: $(-2, 4)$)
- 4. $y = -(x+1)^2 - 3$ (Vertex: $(-1, -3)$)
- 5. $y = (x-1)^2 + 4$ (Vertex: $(1, 4)$)
- 6. $y = (x-2)^2 - 4$ (Vertex: $(2, -4)$)
- 7. $y = -(x-1)^2 + 1$ (Vertex: $(1, -1)$)
- 8. $y = x^2 - 8x + 20$ (Vertex: $(4, -8)$)
- 9. $y = x^2 - 4x - 8$ (Vertex: $(2, -8)$)
- 10. $y = x^2 - 6x + 6$ (Vertex: $(3, -3)$)
- 11. $y = x^2 - 6x + 11$ (Vertex: $(3, -5)$)
- 12. $y = x^2 + 2x + 2$ (Vertex: $(-1, 1)$)
- 13. $y = x(x+4)$ (X-intercepts: $x=0, x=-4$)
- 14. $y = -x^2 - 6x - 12$ (Vertex: $(-3, -3)$)
- 15. $y = x^2 + 4x + 4$ (Vertex: $(-2, 0)$)
- 16. $y = -(x+4)^2 - 3$ (Vertex: $(-4, -3)$)
- 17. $y = -x^2 - 8x - 14$ (Vertex: $(-4, 2)$)
- 18. $y = (x+2)(x+4)$ (X-intercepts: $x=-2, x=-4$)
- 19. $y = (x+2)^2 + 2$ (Vertex: $(-2, 2)$)
- 20. $y = (x+1)^2 - 2$ (Vertex: $(-1, -2)$)
- 21. $y = -(x+4)^2 + 3$ (Vertex: $(-4, 3)$)
- 22. $y = (x+1)^2 + 3$ (Vertex: $(-1, 3)$)

Handwritten Notes:

- General form: $(x-h)^2 + k$
- Vertex form: $(x-(-2))^2 + k$
- Axis of symmetry: $x = -2$
- Factoring: $x(x-4) = 0 \Rightarrow x=0, x=4$
- Quadratic formula: $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(11)}}{2(1)} = \frac{6 \pm \sqrt{36-44}}{2} = \frac{6 \pm \sqrt{-8}}{2}$

$$y = x^2 - 6x + 11$$

$$a = 1 \quad b = -6 \quad c = 11$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(11)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{-8}}{2} = 3$$

weeee!



① $y = -(x-3)^2 - 4$

- Shift right 3 down 4
- Yes reflection $a = -1$
- No Dilation $|a| = 1$
- Vertex: $(3, -4)$
- Axis of sym. $x = 3$
- No x-intercepts

② $y = (x+2)^2 + 4$

- Shifts left 2 up 4
- No Reflection $a = +1$
- No Dilation $|a| = 1$
- Vertex: $(-2, 4)$
- Axis of sym $x = -2$
- No x-intercepts

③ $y = -(x+1)^2 - 3$

- Shift left 1 down 3
- Yes Reflection $a = -1$
- No Dilation
- Vertex: $(-1, -3)$
- Axis of sym. $x = -1$
- No x-intercepts

④ $y = (x-1)^2 + 4$

Vertex: $(1, 4)$
A.O.S. $x = 1$

⑤ $y = -(x+1)^2 - 1$

- Shift left 1 down 1
- Yes Reflection
- No Dil.
- Vertex: $(-1, -1)$
- A.O.S. $x = -1$
- No x-int.

⑥ $y = x^2 - 6x + 11$

A.O.S. $x = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$
Vertex: $(3)^2 - 6(3) + 11$
 $(3, 2)$

⑦ $y = -x^2 - 6x - 6$

- A.O.S. $x = \frac{-(-6)}{2(-1)} = \frac{6}{-2} = -3$
- Vertex: $(-3, 3)$
- Shift left 3 up 3
- Reflected $a = -1$
- Y-int $(0, -6)$

⑧ $y = x^2 - 8x + 20$

- A.O.S. $x = \frac{-(-8)}{2(1)} = \frac{8}{2} = 4$
- Vertex: $(4, 4)$
- Shift right 4 up 4
- No Reflection
- Y-int: $(0, 20)$

⑨ $y = -x^2 - 4x - 8$

- A.O.S. $x = \frac{-(-4)}{2(-1)} = \frac{4}{-2} = -2$
- Vertex: $(-2, -4)$
- Shift left 2 down 4
- Reflected
- Y-int $(0, -8)$

⑩ $y = x(x-4)$

- X-intercepts: $x = 0, x = 4$
- Vertex: $(2, -4)$ • A.O.S. $x = 2$
- Shift right 2 down 4
- No Reflection
- Y-int $(0, 0)$

⑪ $y = x^2 + 2x + 2$

- A.O.S. $x = \frac{-2}{2(1)} = \frac{-2}{2} = -1$
- Vertex: $(-1, 1)$
- Shift left 1 up 1
- Y-int $(0, 2)$
- No Reflection or X-int

⑫ $y = -(x-4)^2 - 3$

- Shift right 4 down 3
- Reflection $a = -1$
- Vertex: $(4, -3)$
- A.O.S. $x = 4$

⑬ $y = -x^2 + 8x - 14$

- A.O.S. $x = \frac{-8}{2(-1)} = \frac{-8}{-2} = 4$
- Vertex: $(4, 2)$
- Shift right 4 up 2
- No reflection
- X-int between 2 and 3 and -2 and -1

⑭ $y = (x-2)(x-4)$

- X-int: $x = 2, x = 4$
- A.O.S. $x = 3$
- Vertex: $(3, -1)$
- Shift right 3 down 1
- No reflection

⑮ $y = (x+2)^2 + 2$

- Vertex: $(-2, 2)$
- A.O.S. $x = -2$
- Shift left 2, up 2
- No reflection or X-int.

Vertex Form

$$f(x) = a(x-h)^2 + k$$

Vertex: (h,k)

h- horizontal shift



k- vertical shift

**Dilation: a**

a is negative:

Reflection

 $0 < a < 1$: shrink $a > 1$: stretch**Axis of Symmetry:**

$$x = h$$

Easily Translatable

Intercept Form

$$f(x) = a(x-p)(x-q)$$

X intercepts/

Solutions/Roots/Zeros:

$$x-p=0$$

$$x-q=0$$

$$x = p \text{ and } x = q$$

Dilation: a

Axis of Symmetry:

Half way between the roots

$$x = h = \frac{p+q}{2}$$

To find Vertex: input the axis of symmetry x value, h, in the function, the y value will be the k

Standard Form

$$f(x) = ax^2 + bx + c$$

no parentheses

Axis of Symmetry:

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

To find Vertex: input the axis of symmetry x value, h, in the function the y value will be the k

Dilation: a

Y Intercept: (0,c)**X intercepts/Roots**

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

Vertex Form	Intercept Form	Standard Form
$f(x) = a(x-h)^2 + k$	$f(x) = a(x-p)(x-q)$	$f(x) = ax^2 + bx + c$ no parentheses
<p>Vertex: (h,k)</p> <p>h- horizontal shift k- vertical shift</p> <p>Dilation: a</p> <p>a is negative: Reflection</p> <p>$-1 < a < 1$: shrink $a > 1$ or $a < -1$ stretch</p> <p>(Graph 2 points: over 1, up a)</p> <p>Axis of Symmetry: $x = h$</p>	<p>X intercepts/ Solutions/Roots/Zeros:</p> <p>$x = p$ and $x = q$ (p,0) (q,0) Dilation: a</p> <p>Axis of Symmetry: Half way between the roots $x = h = \frac{p+q}{2}$</p> <p>To find Vertex: input the axis of symmetry x value, h, in the function, the y value will be the k</p>	<p>Y Intercept: (0,c) + reflected</p> <p>Axis of Symmetry: $x = h = \frac{-b}{2a}$</p> <p>To find Vertex: input the axis of symmetry x value, h, in the function, the y value will be the k</p> <p>Dilation: a</p> <p>X intercepts/Roots: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$</p>

Easily Translatable

2.2 Review Algebra 2 NAME: _____ Date: _____ Hour: _____

REVISED!!!! Form Options: Vertex, Standard, & Intercept form

1. $y = 4(x + 3)^2 - 1$

Graph the functions (4 points)

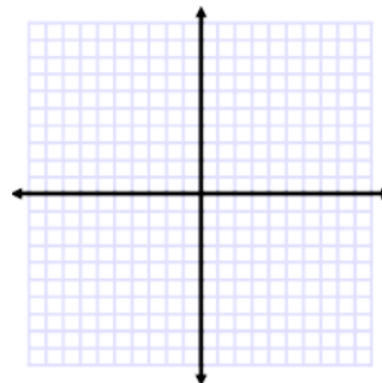
What form is this equation written in? _____ (1 pt)

What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)



2. $F(x) = -1/2 x^2 - 2x + 5$

What form is this equation written in? _____ (1 pt)

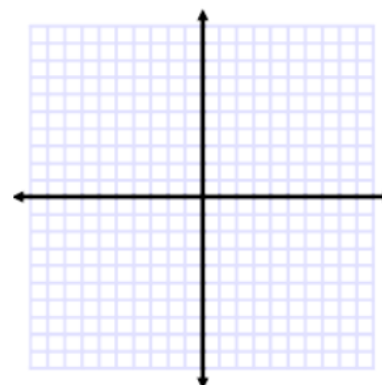
Graph the functions (4 points)

What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)



3. $g(x) = -4(x - 3)(x + 1)$

Graph the functions (4 points)

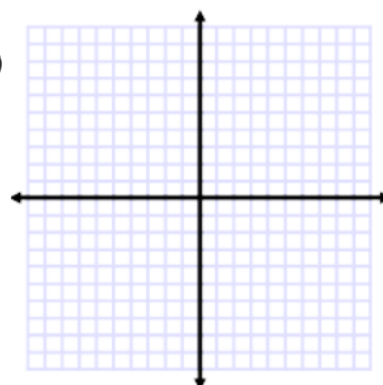
What form is this equation written in? _____ (1 pt)

What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)



2.2 Review Algebra 2 NAME: _____ Date: _____ Hour: _____

4. $y = 1/3x(x - 8)$

What form is this equation written in? _____ (1 pt)

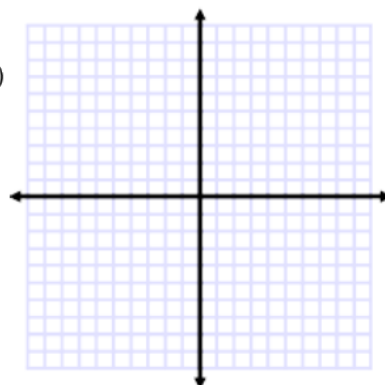
What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)

Graph the functions (4 points)



5. $F(x) = 2(x - 5)^2 - 4$

What form is this equation written in? _____ (1 pt)

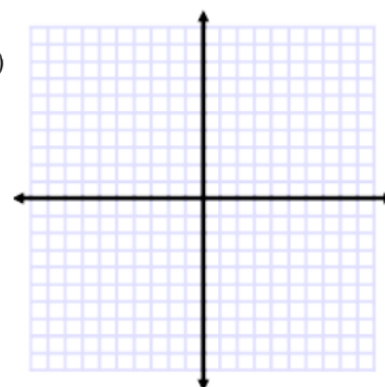
What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)

Graph the functions (4 points)



6. $g(x) = -3x^2 + 4x + 6$

What form is this equation written in? _____ (1 pt)

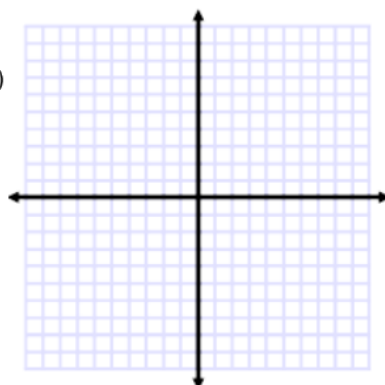
What is the form/equation using a,b,c,h,k,q or p : _____ (1 pt)

What is the Axis of symmetry of this equation: $x =$ _____ (1 point)

What is the VERTEX of this equation: _____ (1 point)

What other points does this equation go through: _____ (2 points)

Graph the functions (4 points)



2.2 Review Algebra 2 NAME: _____ Date: _____ Hour: _____

REVISED!!!! Form Options: Vertex, Standard, & Intercept form

1. $y = 4(x+3)^2 - 1$
 $a=4$ $h=-3$ $k=-1$ Vertex

Graph the functions (4 points)

What form is this equation written in? Vertex (1 pt)

What is the form/equation using a,b,c,h,k,q or p: $f(x) = a(x-h)^2 + k$ (1 pt)

What is the Axis of symmetry of this equation: $x = -3$ (1 point)

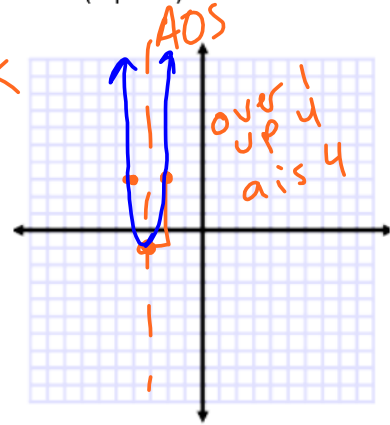
$x = h$ $h = -3$

What is the VERTEX of this equation: _____ (1 point)

Vertex $(h, k) \rightarrow (-3, -1)$

What other points does this equation go through: _____ (2 points)

Plot 2 more Points: Over 1 and up 'a'
 $a = 4$



2. $F(x) = -1/2 x^2 - 2x + 5$
 $a = -1/2$ $b = -2$ $c = 5$ Standard Form

Graph the functions (4 points)

What form is this equation written in? Standard Form (1 pt)

What is the form/equation using a,b,c,h,k,q or p: $f(x) = ax^2 + bx + c$ (1 pt)

What is the Axis of symmetry of this equation: $x = -2$ (1 point)

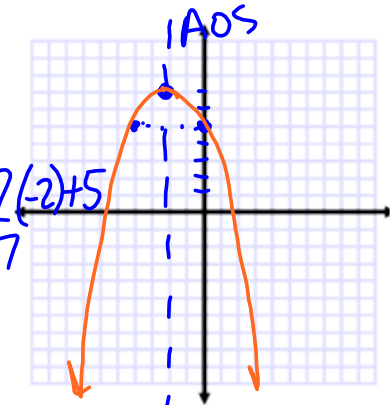
$x = \frac{-b}{2a} = \frac{-(-2)}{2(-1/2)} = \frac{2}{-1} = -2$

What is the VERTEX of this equation: $(-2, 7)$ (1 point)

Plug in AOS x value, find y $y = -\frac{1}{2}(-2)^2 - 2(-2) + 5$
 $y = 7$

What other points does this equation go through: _____ (2 points)

the y intercept $(0, c) \rightarrow (0, 5)$
 and its reflected point $(-4, 5)$



3. $g(x) = -4(x-3)(x+1)$
 $p = 3$ $q = -1$ Intercept

Graph the functions (4 points)

What form is this equation written in? Intercept (1 pt)

What is the form/equation using a,b,c,h,k,q or p: $f(x) = a(x-p)(x-q)$ (1 pt)

What is the Axis of symmetry of this equation: $x = 1$ (1 point)

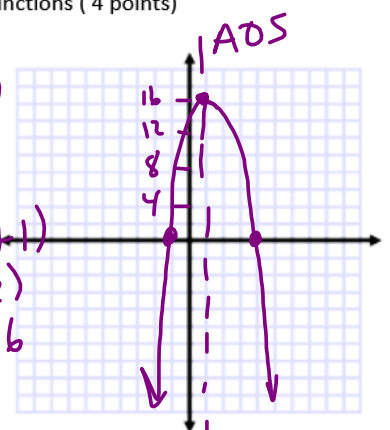
$x = \frac{p+q}{2} = \frac{3+(-1)}{2} = \frac{2}{2} = 1$

What is the VERTEX of this equation: $(1, 16)$ (1 point)

Plug in x value, find y
 AOS $y = -4(1-3)(1+1)$
 $y = -4(-2)(2)$
 $y = 16$

What other points does this equation go through: _____ (2 points)

$-4(x-3)(x+1) = 0$
 $x-3 = 0$ $x+1 = 0$
 $+3 +3$ $-1 -1$
 $x = 3$ $x = -1$
 $(3, 0)$ $(-1, 0)$



2.2 Review Algebra 2 NAME: _____ Date: _____ Hour: _____

4. $y = 1/3x(x - 8)$

① What form is this equation written in? Intercept (1 pt)
 ② What is the form/equation using a,b,c,h,k,q or p : $f(x) = a(x-p)(x-q)$ (1 pt)

What is the Axis of symmetry of this equation: $x = 4$ (1 point)

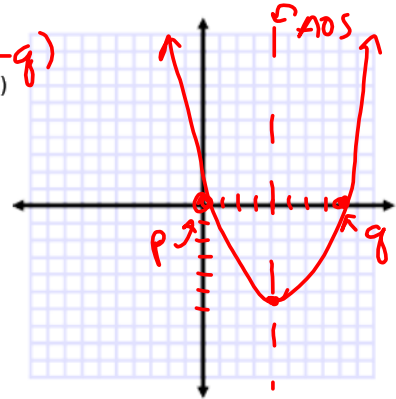
$x = \frac{p+q}{2} = \frac{0+8}{2} = 4$

What is the VERTEX of this equation: $(4, 5.3)$ (1 point)

$y = \frac{1}{3}(4)(4-8) = \frac{1}{3}(4)(-4) = -5.3$

③ What other points does this equation go through: $(0, 0)$ and $(8, 0)$ (2 points)
 $x = 0$ $x - 8 = 0$
 $p = 0$ $x = 8$ and $q = 8$

Graph the functions (4 points)



5. $F(x) = 2(x - 5)^2 - 4$

What form is this equation written in? Vertex (1 pt)

What is the form/equation using a,b,c,h,k,q or p : $f(x) = a(x-h)^2 + k$ (1 pt)

What is the Axis of symmetry of this equation: $x = 5$ (1 point)

$x = h = 5$

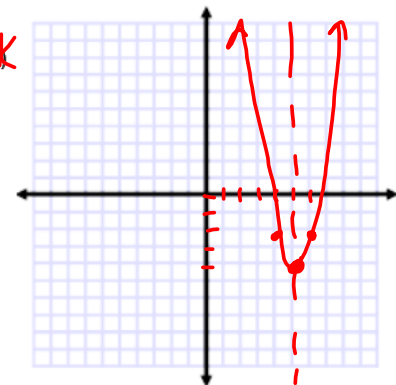
What is the VERTEX of this equation: $(5, -4)$ (1 point)

$(h, k) = (5, -4)$

What other points does this equation go through: _____ (2 points)

over 1, up 2 $(6, -2)$
 $(4, -2)$

Graph the functions (4 points)



6. $g(x) = -3x^2 + 4x + 6$

What form is this equation written in? Standard (1 pt)

What is the form/equation using a,b,c,h,k,q or p : $f(x) = ax^2 + bx + c$ (1 pt)

What is the Axis of symmetry of this equation: $x = 0.6\bar{6}$ (1 point)

$x = \frac{-b}{2a} = \frac{-(4)}{2(-3)} = \frac{-4}{-6} = \frac{2}{3}$

What is the VERTEX of this equation: _____ (1 point)

$y = -3(\frac{2}{3})^2 + 4(\frac{2}{3}) + 6 = 7.\bar{3}$ $(0.\bar{6}, 7.\bar{3})$

What other points does this equation go through: _____ (2 points)

y intercept $(0, 6)$
 $(0, 6)$ and $(1.\bar{3}, 6)$

Graph the functions (4 points)

