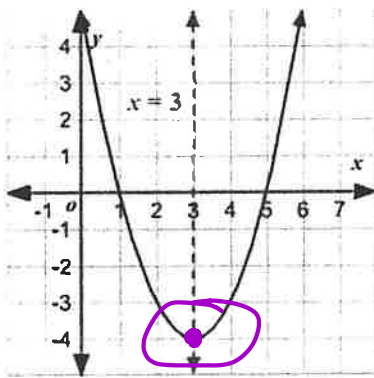
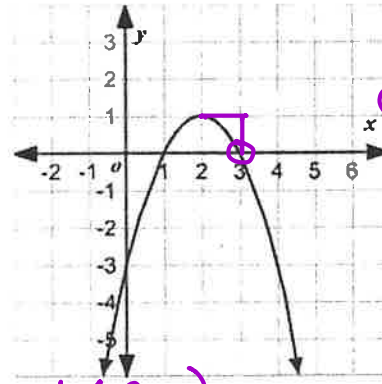


I. Parts of a Quadratic Graph:  $y = x^2$

- A) The graph of a quadratic function is called a Parabola.
- B) All quadratic functions have either a Maximum or a Minimum located at the vertex.
- C) The Axis of Symmetry is a line of reflection that runs vertically through the vertex and divides the parabola into two equal parts. It is always written as  $x =$ .
- D) The y - intercept is where the parabola crosses the y - axis.
- E) The x - intercept is where the parabola crosses the x - axis. These are also referred to as the zeros / roots / solutions of the quadratic function.
- F) If the function is equal to 0, then the x-intercepts are also called the \_\_\_\_\_.



Vertex: (3, -4)  
 Maximum or Minimum  
 Axis of Symmetry:  $x = 3$   
 y - intercept: (0, 5)  
 x - intercepts: (1, 0), (5, 0)  
 Domain:  $(-\infty, \infty)$   
 Range:  $[-4, \infty)$



Vertex: (2, 1)  
 Maximum or Minimum  
 Axis of Symmetry:  $x = 2$   
 y - intercept: (0, -3)  
 x - intercepts: (1, 0), (3, 0)  
 Domain:  $(-\infty, \infty)$   $\mathbb{R}$   
 Range:  $(-\infty, 1]$

$y = (x - 3)^2 - 4$

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

II. Ways to write quadratic functions:

- A) **Standard Form:**  $y = ax^2 + bx + c$  *calc*
- C) **x - intercept Form:**  $y = a(x - \text{intercept } \#)(x - \text{intercept } \#)$
- B) **Vertex Form:**  $y = a(x - h)^2 + k$
- Vertex: (h, k)
  - Translation left or right: h
  - Translation up or down: k
  - Dilation: If  $a > 1$  the graph stretches  
 If  $0 < a < 1$  the graph compresses
  - Reflection: a is negative

$y = (x + 3)^2 - 2$   
 v: (-3, -2)

## Different Forms of a Quadratic Equation:

1.  $y = 5x^2$   $\begin{matrix} \text{S+} \\ \downarrow \end{matrix}$

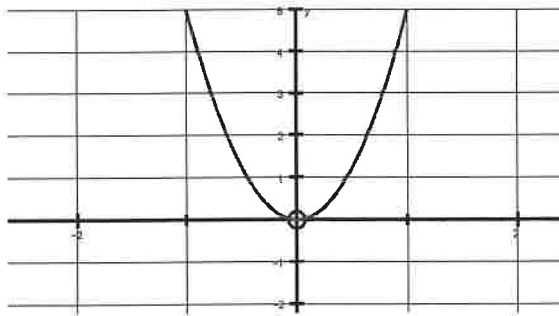
Vertex (0, 0)

Max or Min Min

Axis of Symmetry:  $x = 0$

y-intercept: (0, 0)

x-intercept(s): (0, 0)



2.  $y = x^2 + 3x$   $\text{S+}$

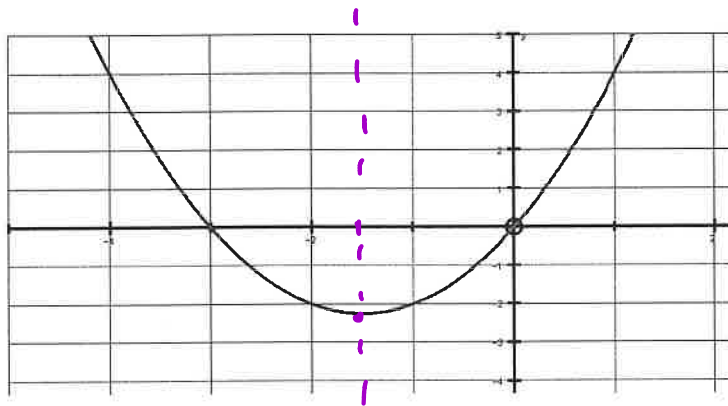
Vertex (-1.5, -2.25)

Max or Min Min

Axis of Symmetry:  $x = -1.5$

y-intercept: (0, 0)

x-intercept(s): (-3, 0), (0, 0)



3.  $y = (x + 4)(x + 2)$   $\begin{matrix} -4 & -2 \\ \text{X-int} \end{matrix}$

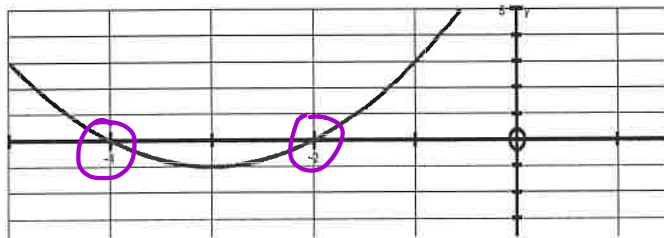
Vertex (-3, -1)

Max or Min Min

Axis of Symmetry:  $x = -3$

y-intercept: (0, 8)

x-intercept(s): (-4, 0), (-2, 0)



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

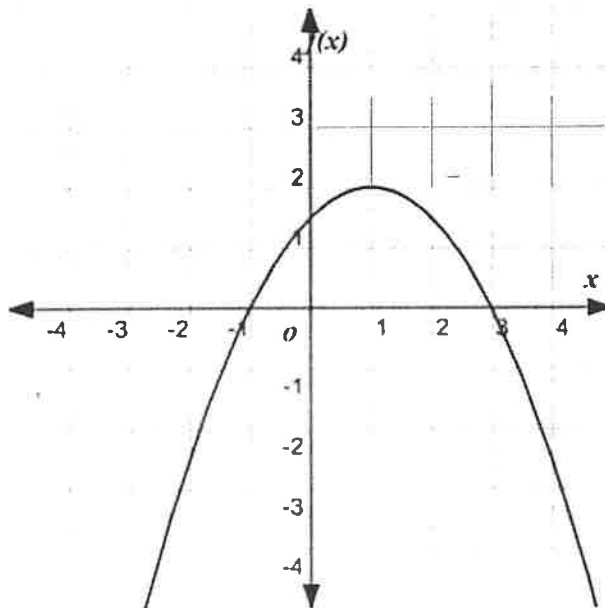
Vertex (1, 2)

Max or Min Max

Axis of Symmetry:  $x = 1$

y-intercept: (0, 1.5)

x-intercept(s): (-1, 0), (3, 0)



❖ Example: Complete the following chart using the vertex form,  $y = a(x - h)^2 + k$ , of a quadratic function.

Function	Vertex	Left/Right Translation	Up/Down Translation	Dilation (Stretch or Compress)	Reflection (Yes or No)	Domain	Range	Max/Min
1. $y = x^2$ (Parent Function)	(0,0)	/	/	/	/	$\mathbb{R}$	$[0, \infty)$	min
2. $y = (x + 2)^2 + 3$	(-2,3)	L 2	U 3	/	/	↓	$[3, \infty)$	min
3. $y = x^2 - 3$	(0,-3)	/	D 3	/	/		$[-3, \infty)$	min
4. $y = 2(x - 5)^2$	(5,0)	R 5	/	S by 2	/		$[0, \infty)$	min
5. $y = -3x^2 + 1$	(0,1)	/	U 1	S by 3	Yes		$(-\infty, 1]$	Max
6. $y = \frac{1}{2}(x + 1)^2 - 4$	(-1,-4)	L 1	D 4	C by 1/2	/		$[-4, \infty)$	min

### III. Graphing quadratic functions using vertex form.

<p>1. <math>y = x^2</math></p> <p>Vertex <u>(0,0)</u></p>	<p>2. <math>y = (x + 2)^2 - 3</math></p> <p>L 2 D 3</p> <p>Vertex <u>(-2,-3)</u></p>	<p>3. <math>y = -(x - 1)^2</math></p> <p>Vertex <u>(1,0)</u></p>
<p>4. <math>y = x^2 - 2</math></p> <p>Vertex <u>(0,-2)</u></p>	<p>5. <math>y = 2(x - 3)^2 - 4</math></p> <p>Vertex <u>(3,-4)</u></p>	<p>6. <math>y = \frac{1}{2}x^2 + 1</math></p> <p>Vertex <u>(0,1)</u></p>

Math 2 – Honors  
 Unit 2 – Quadratic Functions  
 Lesson 3 – Graphs of Quadratic Functions – HOMEWORK

Name \_\_\_\_\_  
 Date \_\_\_\_\_ Pd \_\_\_\_\_

1. Complete the following chart using the vertex form,  $y = a(x - h)^2 + k$ , of a quadratic function.

Function	Vertex	Left/Right Translation	Up/Down Translation	Dilation (Stretch or Compress)	Reflection (Yes or No)	Domain	Range
1. $y = x^2$ (Parent Function)						R	
2. $y = x^2 - 7$						↓	
3. $y = -2(x + 1)^2$							
4. $y = (x - 3)^2 + 8$							
5. $y = 4x^2$							
6. $y = -\frac{2}{3}(x - 2)^2$							
7. $y = -x^2$							
8. $y = \frac{1}{2}(x + 6)^2 - 2$							
9. $y = -x^2 + 9$							
10. $y = -\frac{1}{4}(x - 4)^2$							

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