

## Graphing Quadratic Functions

## SHOW YOUR WORK!!

Define each of the following terms. Use your notes if you need help.

1. Axis of Symmetry - the vertical line that divides the parabola into two equal parts.
2. Domain - input,  $x$ -values, the set of values for the independent variable.
3. Parabola - the U-shaped curve created by a quadratic function.
4. Quadratic - a function where the highest degree or exponent is squared ( $x^2$ ).
5. Range - output,  $y$ -values, the set of values for the dependent variable.
6. Transformation - a change in the size or position of a graph.
7. Vertex - the turning point of the parabola.
8. X-intercepts (Zeros or Roots) - the points where the graph crosses the  $x$ -axis.
9. Y-intercept - the point where the graph crosses the  $y$ -axis.

Fill in the blank with the appropriate expression.

10. The standard form of a quadratic equation is  $y = ax^2 + bx + c$  where  $a \neq 0$ .
  - a. The formula for the axis of symmetry is  $x = \frac{-b}{2a}$ .
11. The vertex form of a quadratic equation is  $y = a(x-h)^2 + k$ .
  - a. The formula for the vertex is  $(h, k)$ .
  - b. The formula for the axis of symmetry is  $x = h$ .
12. The parent function of a quadratic is  $y = x^2$ .
13. When ' $a$ ' is positive, does the parabola open up or down? up.
14. When ' $a$ ' is negative, does the parabola open up or down? down.
15. When a parabola opens up, is the vertex a maximum or minimum? minimum.
16. When a parabola opens down, is the vertex a maximum or minimum? maximum.



Find the axis of symmetry, vertex, domain, and range for each quadratic function.

17)  $y = -2x^2 + 8x + 1$

$$x = \frac{-8}{2(-2)} = \frac{-8}{-4} = 2$$

Open Up or Down?: Down

Axis of Symmetry:  $x = 2$

Vertex:  $(2, 9)$

Max or Min?: Maximum

18)  $y = 5x^2 - 10x$

$$x = \frac{-(-10)}{2(5)} = \frac{10}{10} = 1$$

Open Up or Down?: Up

Axis of Symmetry:  $x = 1$

Vertex:  $(1, -5)$

Max or Min?: Minimum

19)  $y = \frac{1}{2}x^2 + 4$

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

Open Up or Down?: Up

Axis of Symmetry:  $x = 0$

Vertex:  $(0, 4)$

Max or Min?: Minimum

Analyze the graph of each quadratic function. Identify the axis of symmetry, vertex,  $y$ -intercept,  $x$ -intercepts, domain, and range.

20)

Axis of Symmetry:  $x = -2$

Vertex:  $(-2, 4)$

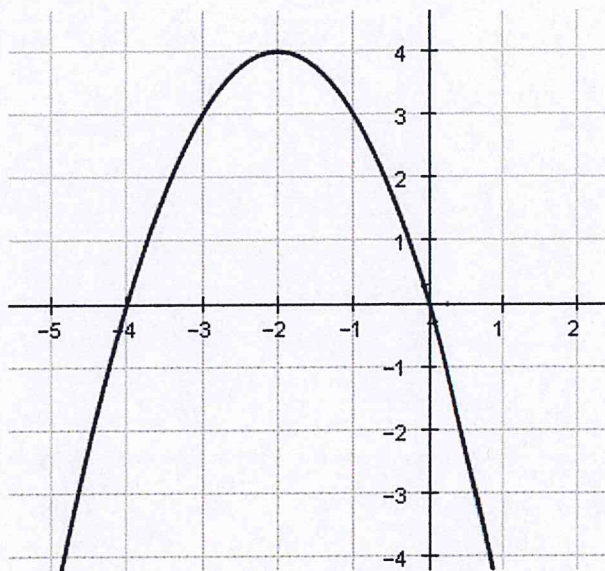
Max or Min? Maximum

$y$ -intercept:  $(0, 0)$

$x$ -intercepts:  $(-4, 0), (0, 0)$

Domain:  $\mathbb{R}$

Range:  $y \leq 4$



21)

Axis of Symmetry:  $x = -2$

Vertex:  $(-2, -3)$

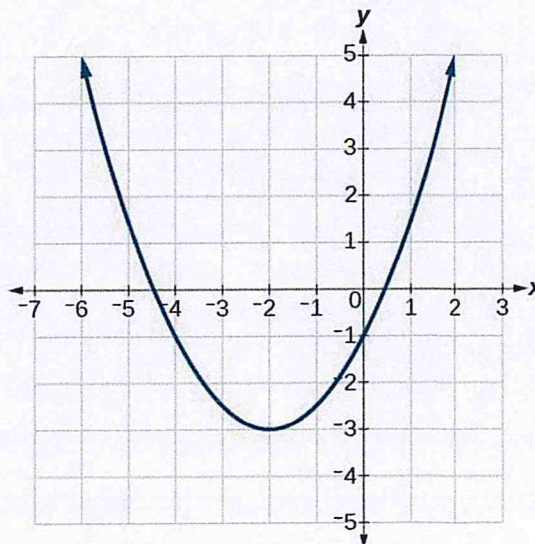
Max or Min? Minimum

$y$ -intercept:  $(0, -1)$

$x$ -intercepts:  $(-4.5, 0), (0.5, 0)$

Domain:  $\mathbb{R}$

Range:  $y \geq -3$



Graph each quadratic function. Find the axis of symmetry, vertex, domain, and range.

22)  $y = -3x^2 + 6x + 5$

$$x = \frac{-6}{2(-3)} = \frac{-6}{-6} = 1$$

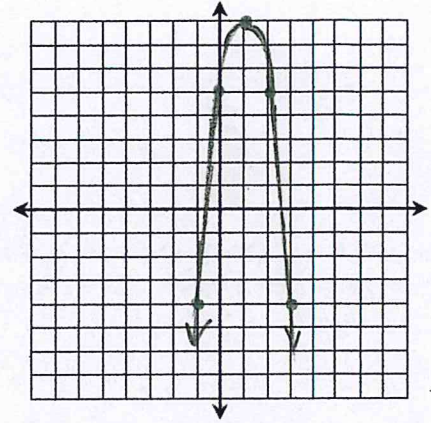
Axis of Symmetry:  $x = 1$

Vertex:  $(1, 8)$

Domain:  $\mathbb{R}$

Range:  $y \leq 8$

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



23)  $y = -\frac{1}{2}x^2 - 2x - 4$

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

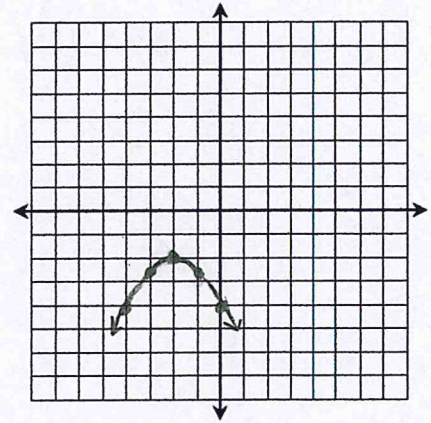
Axis of Symmetry:  $x = -2$

Vertex:  $(-2, -2)$

Domain:  $\mathbb{R}$

Range:  $y \leq -2$

x	y
-4	-4
-3	$-2\frac{1}{2}$
-2	-2
-1	$-2\frac{1}{2}$
0	-4



24)  $y = 2x^2 + 4x + 1$

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

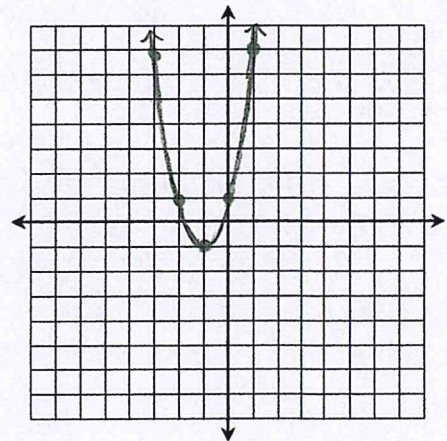
Axis of Symmetry:  $x = -1$

Vertex:  $(-1, -1)$

Domain:  $\mathbb{R}$

Range:  $y \geq -1$

x	y
-3	7
-2	1
-1	-1
0	1
1	7





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

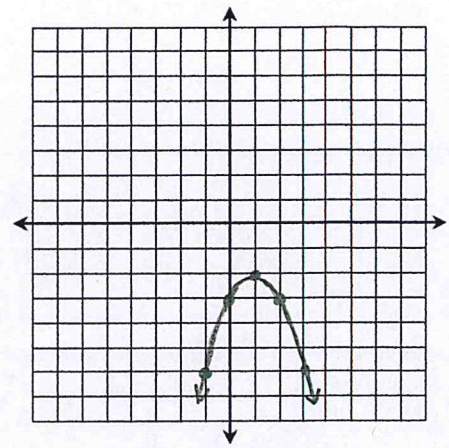
Axis of Symmetry:  $x = 1$

Vertex:  $(1, -2)$

Domain:  $\mathbb{R}$

Range:  $y \leq -2$

$x$	$y$
-1	-6
0	-3
1	-2
2	-3
3	-6



Describe the transformation of each quadratic function from the parent function,  $y = x^2$ .

26)  $y = (x - 7)^2 - 4$

Right 7, Down 4

27)  $y = -3(x + 2)^2$

Reflect over the  $x$ -axis, Stretch by 3, Left 2

28)  $y = -2x^2 + 9$

Reflect over the  $x$ -axis, Stretch by 2, up 9