**9-1 Study Guide and Intervention**

***Graphing Quadratic Functions***

**Characteristics of Quadratic Functions**

|  |  |  |
| --- | --- | --- |
| **Quadratic**  **Function** | a function described by an equation of the form *f*(*x*) = *a* + *bx* + *c,* where *a* ≠ 0 | **Example:** *y* = 2 + 3*x* + 8 |

The parent graph of the family of quadratic functions is *y* = *.* Graphs of quadratic functions have a general shape called a **parabola**. A parabola opens upward and has a **minimum point** when the value of *a* is positive, and a parabola opens downward and has a **maximum point** when the value of *a* is negative.

**Example 1:**

**a. Use a table of values to graph *y* = – 4*x* + 1.**

|  |  |
| --- | --- |
| x | 5-m-1.jpgy |
| –1 | 6 |
| 0 | 1 |
| 1 | –2 |
| 2 | –3 |
| 3 | –2 |
| 4 | 1 |

Graph the ordered pairs in the table and connect them with a smooth curve.

**b. What are the domain and range of this function?**

The domain is all real numbers. The range is all real numbers greater than or equal to –3, which is the minimum.

**Example 2:**

**a. Use a table of values to graph *y* = –– 6*x* – 7.**

|  |  |
| --- | --- |
| x | 5-m-2.jpgy |
| –6 | –7 |
| –5 | –2 |
| –4 | 1 |
| –3 | 2 |
| –2 | 1 |
| –1 | –2 |
| 0 | –7 |

Graph the ordered pairs in the table and connect them with a smooth curve.

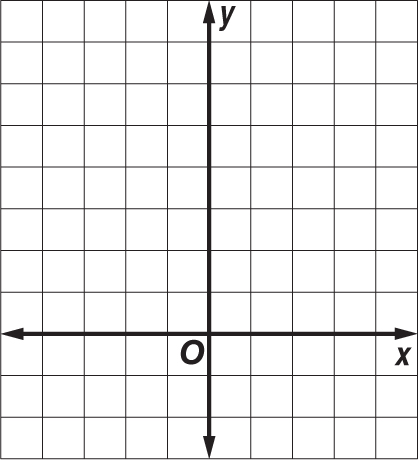
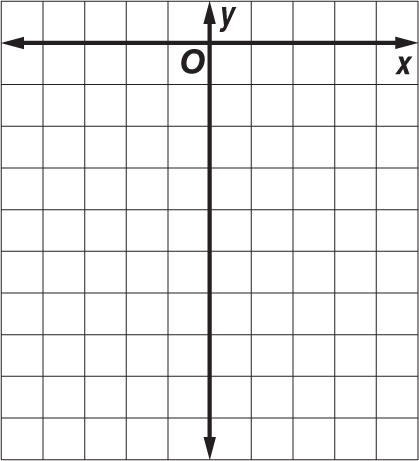
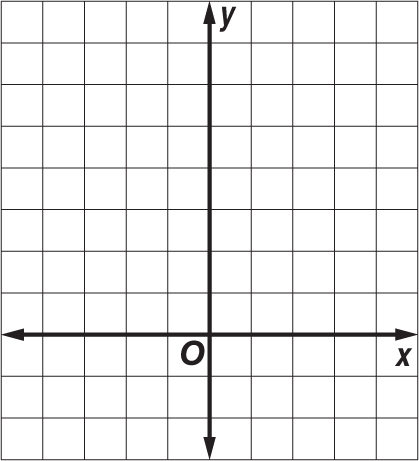
**b. What are the domain and range of this function?**

The domain is all real numbers. The range is all   
real numbers less than or equal to 2, which is the maximum.

**Exercises**

**Use a table of values to graph each function. Determine the domain and range.**

**1.** *y* = + 2 **2.** *y* = – – 4 **3.** *y* = – 3*x* + 2



**9-1 Study Guide and Intervention** *(continued)*

***Graphing Quadratic Functions***

**Symmetry and Vertices** Parabolas have a geometric property called **symmetry**. That is, if the figure is folded in half, each half will match the other half exactly. The vertical line containing the fold line is called the **axis of symmetry**. The axis of symmetry contains the minimum or maximum point of the parabola, the **vertex**.

|  |  |  |
| --- | --- | --- |
| **Axis of**  **Symmetry** | For the parabola *y* = *a* + *bx* + *c*, where *a* ≠ 0, the line *x* = –  is the axis of symmetry. | **Example:** The axis of symmetry of *y* = + *2*x + 5 is the line *x* = –1. |

**Example : Consider the graph of *y* = 2 + 4*x* + 1*.***

**a. Write the equation of the axis of symmetry.**

In *y* = 2 + 4*x* + 1, *a* = 2 and *b* = 4.

Substitute these values into the equation of the   
axis of symmetry.

*x* = –

*x* = –

= –1

The axis of symmetry is *x* = –1.

**b. Find the coordinates of the vertex.**

Since the equation of the axis of symmetry is *x* = –1 and the vertex lies on the axis, the *x*–coordinate of the vertex is –1.

*y* = 2 + 4*x* + 1 Original equation

*y* = 2 + 4(–1) + 1 Substitute.

*y* = 2(1) – 4 + 1 Simplify.

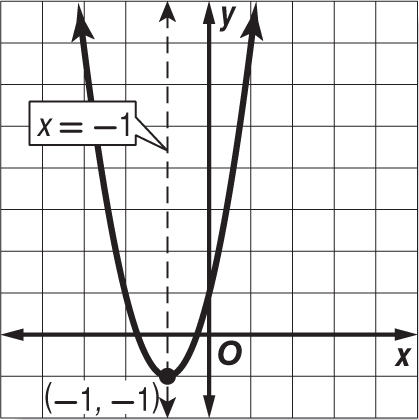
*y* = –1

The vertex is at (–1, –1).

**c. Identify the vertex as a maximum or a minimum.**

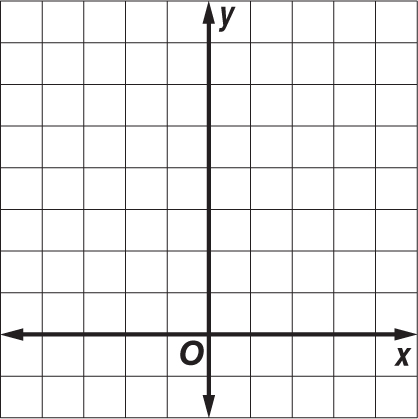
Since the coefficient of the -term is positive, the parabola opens upward, and the vertex is a minimum point.

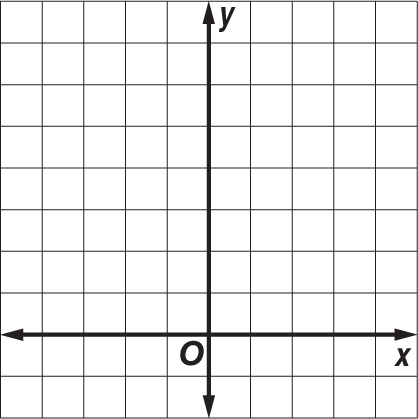
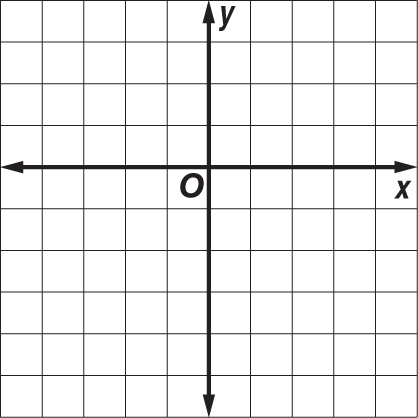
**d. Graph the function.**

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**Exercises**

**Consider each equation. Determine whether the function has *maximum* or *minimum* value. State the maximum or minimum value and the domain and range of the function. Find the equation of the axis of symmetry. Graph the function.**

** 1.** *y* = + 3 **2.** *y* = – – 4*x* – 4 **3.** *y* = + 2*x* + 3

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