Name ____ Date ____________

Up and Down or Down and Up
Exploring Quadratic Functions

Vocabulary

Write the given quadratic function in standard form. Then describe the shape of the graph and whether it has an absolute maximum or absolute minimum. Explain your reasoning.

$2x^2 = x + 4$

Problem Set

Write each quadratic function in standard form.

1. $f(x) = x(x + 3)$

   $f(x) = x(x + 3)$

   $f(x) = x \cdot x + x \cdot 3$

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

2. $f(x) = 3x(x - 8) + 5$

3. $g(s) = (s + 4)s - 2$

4. $d(t) = (20 + 3t)t$

5. $f(n) = \frac{2n(3n - 6)}{3}$

6. $m(s) = \frac{s(s + 3)}{4}$

Write a quadratic function in standard form that represents each area as a function of the width. Remember to define your variables.

7. A builder is designing a rectangular parking lot. She has 300 feet of fencing to enclose the parking lot around three sides.

Let x = the width of the parking lot

The length of the parking lot = $300 - 2x$

Let A = the area of the parking lot

Area of a rectangle = width × length

$$A = w \cdot l$$

$$A(x) = x \cdot (300 - 2x)$$

$$= x \cdot 300 - x \cdot 2x$$

$$= 300x - 2x^2$$

$$= -2x^2 + 300x$$

8. Aiko is enclosing a new rectangular flower garden with a rabbit garden fence. She has 40 feet of fencing.

9. Pedro is building a rectangular sandbox for the community park. The materials available limit the perimeter of the sandbox to at most 100 feet.

Name ______________________________ Date ____________

10. Lea is designing a rectangular quilt. She has 16 feet of piping to finish the quilt around three sides.

11. Kiana is making a rectangular vegetable garden alongside her home. She has 24 feet of fencing to enclose the garden around the three open sides.

12. Nelson is building a rectangular ice rink for the community park. The materials available limit the perimeter of the ice rink to at most 250 feet.

Use your graphing calculator to determine the absolute maximum of each function. Describe what the x- and y-coordinates of this point represent in terms of the problem situation.

13. A builder is designing a rectangular parking lot. He has 400 feet of fencing to enclose the parking lot around three sides. Let x = the width of the parking lot. Let A = the area of the parking lot. The function $A(x) = -2x^2 + 400x$ represents the area of the parking lot as a function of the width.

The absolute maximum of the function is at (100, 20,000).

The x-coordinate of 100 represents the width in feet that produces the maximum area.

The y-coordinate of 20,000 represents the maximum area in square feet of the parking lot.

14. Joelle is enclosing a portion of her yard to make a pen for her ferrets. She has 20 feet of fencing. Let x = the width of the pen. Let A = the area of the pen. The function $A(x) = -x^2 + 10x$ represents the area of the pen as a function of the width.

15. A baseball is thrown upward from a height of 5 feet with an initial velocity of 42 feet per second. Let t = the time in seconds after the baseball is thrown. Let h = the height of the baseball. The quadratic function $h(t) = -16t^2 + 42t + 5$ represents the height of the baseball as a function of time.

16. Hector is standing on top of a playground set at a park. He throws a water balloon upward from a height of 12 feet with an initial velocity of 25 feet per second. Let t = the time in seconds after the balloon is thrown. Let h = the height of the balloon. The quadratic function $h(t) = -16t^2 + 25t + 12$ represents the height of the balloon as a function of time.

17. Franco is building a rectangular roller-skating rink at the community park. The materials available limit the perimeter of the skating rink to at most 180 feet. Let x = the width of the skating rink. Let A = the area of the skating rink. The function $A(x) = -x^2 + 90x$ represents the area of the skating rink as a function of the width.

18. A football is thrown upward from a height of 6 feet with an initial velocity of 65 feet per second. Let t = the time in seconds after the football is thrown. Let h = the height of the football. The quadratic function $h(t) = -16t^2 + 65t + 6$ represents the height of the football as a function of time.