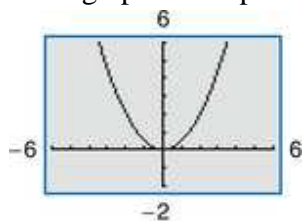


Quadratic Functions

Warm-up

Consider the graph of the parent function $f(x) = x^2$:

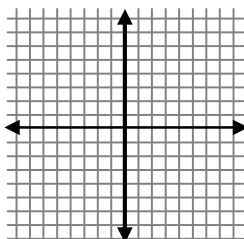


- What is the domain?
- What is the range?
- What is the vertex?
- On what open interval is it increasing?
- On what open interval is it decreasing?
- Does it have a minimum or maximum?
- What is the axis of symmetry (line of symmetry)?
- What is the x-intercept(s)?

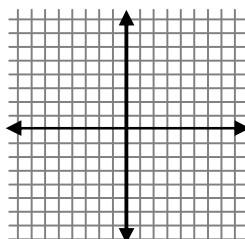
Transformations of the Quadratic Parent Function $f(x) = x^2$

Example 1: Sketch the graph of the function and describe the transformation.

a) $g(x) = -x^2 + 1$



b) $h(x) = (x + 2)^2 - 3$



Quadratic Functions

Vertex Form of a Quadratic Function (aka Standard Form)

_____ Vertex: _____

When $a > 0$, parabola opens _____.

When $a < 0$, parabola opens _____.

Determining the Vertex of a Quadratic Function : 2 Methods

Method 1

$$f(x) = 2x^2 + 8x + 7$$

Method 2

$$f(x) = 2x^2 + 8x + 7$$

Finding x-intercepts

Find x-intercepts of $f(x) = ax^2 + bx + c$:

1. _____

2. _____

Example 2

Given: $f(x) = -x^2 + 6x - 8$.

a) Find the vertex
Method 1

Method 2

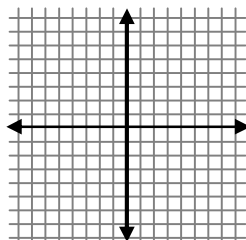
b) Find the x-intercept(s)

c) Does it open up or down?

Quadratic Functions

d) Is it a vertical stretch or vertical shrink?

e) Sketch the graph



Example 3

Write the standard form of the equation of the parabola whose vertex is $(1, 2)$ and that passes through the point $(3, -6)$.

Practice Problem 1

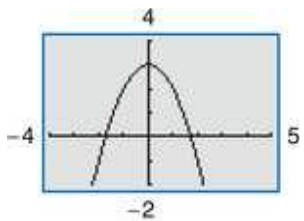
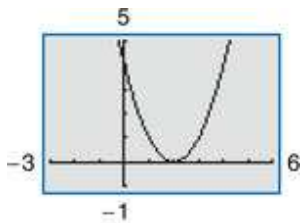
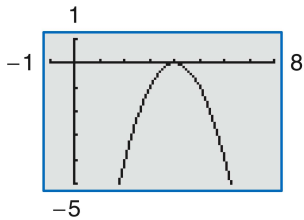
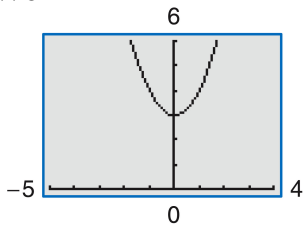
Write the standard form of the equation of the parabola whose vertex is $(-2, 5)$ and that passes through the point $(0, 9)$.

Example 4

A baseball is hit at a point 3 feet above the ground at a velocity of 100 feet per second and at an angle of 45 degrees with respect to the ground. The path of the baseball is given by the function $f(x) = -0.0032x^2 + x + 3$, where $f(x)$ is the height of the baseball (in feet) and x is the horizontal distance from home plate (in feet). What is the maximum height reached by the baseball?

Quadratic Functions

Class Work



1. Write the correct function next to the correct graph above:

$$f(x) = (x - 2)^2 \quad f(x) = 3 - x^2 \quad f(x) = x^2 + 3 \quad f(x) = (x - 4)^2$$

2. Identify the vertex of the function and state whether it opens up or down:

$$f(x) = x^2 - 8x + 16$$

3. Given: $f(x) = -(x^2 + 3x - 3)$

a) Vertex: _____

b) Opens: _____

c) x-intercept(s): _____

Quadratic Functions

4. Write the standard form of the quadratic function that has vertex $(1, -2)$ and goes through the point $(-1, 14)$.

5. The height y (in feet) of a punted football is approximated by $y = -\frac{16}{2025}x^2 + \frac{9}{5}x + \frac{3}{2}$ where x is the horizontal distance (in feet) from where the football is punted.



- How high is the football when it is punted? (*Hint*: Find y when $x = 0$)
- What is the maximum height of the football?
- How far from the punter does the football strike the ground?