Introduction to Quadratic Functions

Standard Form Equations

$$f(x) = ax^2 + bx + c$$

a:

b:

c:

Vertex Form Equations

$$f(x) = a(x - h)^2 + k$$

a:

h:

k:

Factored Form Equations

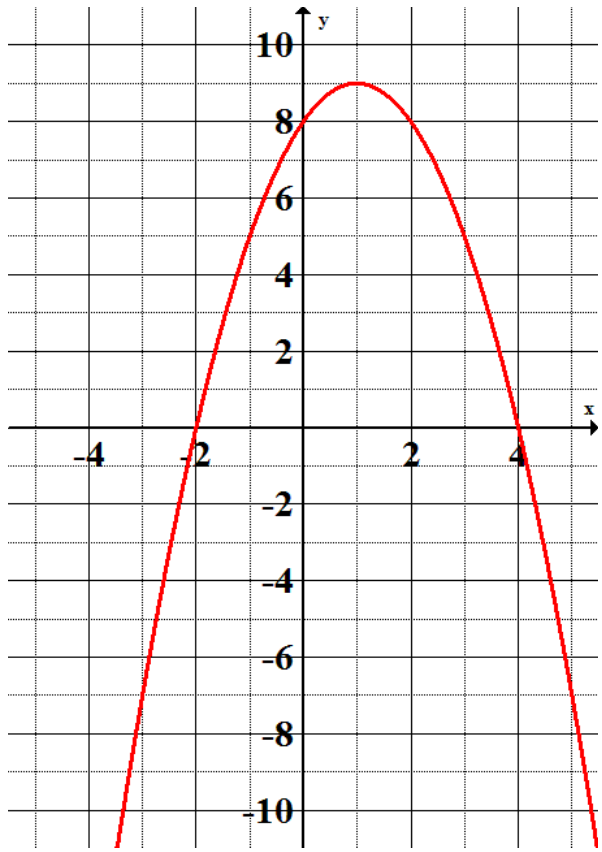
$$f(x) = a(x - r)(x - s)$$

a:

r:

s:

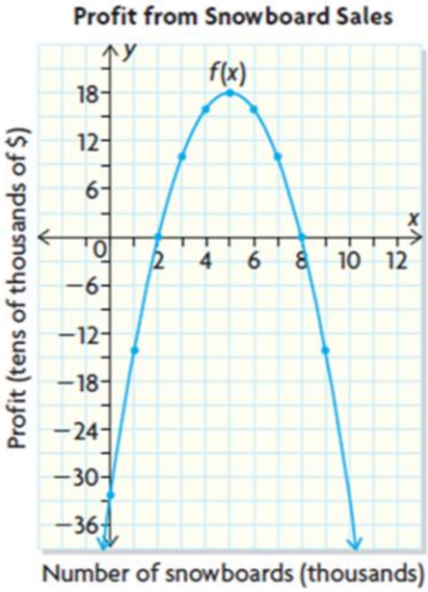
Information from Graphs



Vertex	**Maximum / Minimum Value**
Direction of Opening	**Zeros**
Axis of Symmetry	**y-Intercept**
Domain	**Range**

Applying the Basics

1. Determine an expression to model the situation.



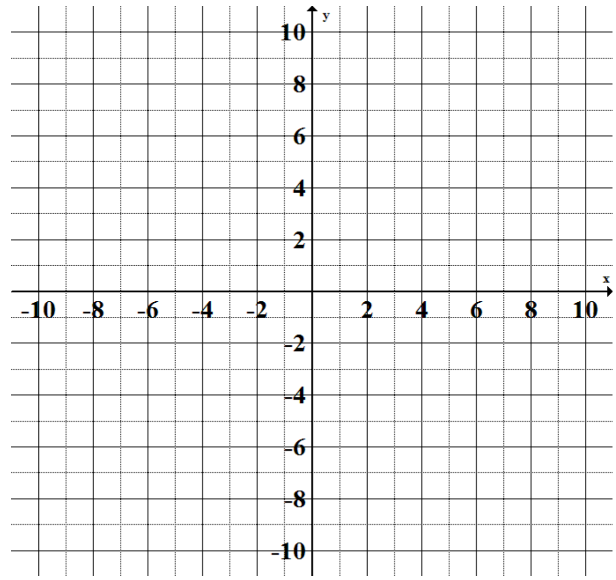
2. A stone is thrown into the air from a bridge over a river. It falls into the river. The height of the stone, *h* in meters, above the water *t* seconds after the stone is thrown is modelled by the equation $h = -5t^2 + 10t + 7$.
   a. How high is the bridge?

   b. How long does it take the stone to reach the water?

   c. What is the maximum height reached by the stone and when does this occur?

   d. Determine the domain and range of the function in this situation.

3. Given $f(x) = -3(x+5)^2 - 1$, state the vertex, axis of symmetry, direction of opening, y-intercept, step pattern, domain and range. Graph the function.



4. Given $f(x) = 2(x+1)(x-3)$, state the vertex, axis of symmetry, direction of opening, y-intercept, and step pattern.

5. Given a function with a vertex of (5, 18) and zeros x = 2,and 8, state the equation of the function in:

a. Vertex Form

b. Factored Form

c. Standard Form

Maximum and Minimum Values

To find maximum and maximum values of a quadratic, we need the vertex.

If we are given a standard form equation, we can:

A. Complete the square to get vertex form
B. Find the factored form and then determine the vertex
C. Find two symmetrical points and then determine the vertex

Example

A golfer attempts to hit a golf ball over a gorge from a platform above the ground. The function that models the height of the ball is: $h(t) = -5t^2 + 40t + 100$ where *h(t)* is the height in meters at time *t* seconds after contact. There are power lines 185 m above the ground. Will