Lesson 4.2 Warm Up

1. What is the vertex form of a parabola?

2. Describe the transformations for the graph of the function $f(x) = -2/3(x - 4)^2 + 8$.

3. A set of data was found to have a correlation coefficient of 0.105. Interpret its meaning.

Lesson 4.2 Standard Form of a Quadratic Function

Essential Understanding: For any quadratic function $f(x) = ax^2 + bx + c$, the values of a, b, and c provide key information about its graph.

The standard form of a quadratic function is $f(x) = ax^2 + bx + c$, where $a \neq 0$.

You can find information about the graph of a quadratic function (such as the vertex) easily from the vertex form. Such information is "hidden" in standard form. However, standard form is easier to enter into a graphing calculator.

Either go to desmos.com for a graphing calculator or use a graphing calculator. We will use either one to find the different pieces of a quadratic function's graph, the parabola.

Ex. Graph $y = 2x^2 + 8x - 2$. Find the following:

vertex:

maximum/minimum value:

domain:

range:

Ex. Graph $y = -3x^2 - 4x + 6$. Find the following:

vertex:

maximum/minimum value:

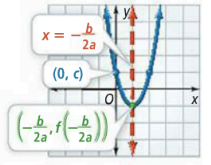
domain:

range:

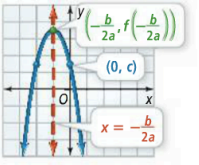
Properties Quadratic Function in Standard Form

- The graph of $f(x) = ax^2 + bx + c$, $a \neq 0$, is a parabola.
- If $a > 0$, the parabola opens upward. If $a < 0$, the parabola opens downward.
- The axis of symmetry is the line $x = -\frac{b}{2a}$.
- The x-coordinate of the vertex is $-\frac{b}{2a}$. The y-coordinate of the vertex is the y-value of the function for $x = -\frac{b}{2a}$, or $y = f\left(-\frac{b}{2a}\right)$.
- The y-intercept is $(0, c)$.

$y = ax^2 + bx + c, a > 0$



$y = ax^2 + bx + c, a < 0$



Ex. Without your graphing device, graph $y = x^2 + 2x + 3$.

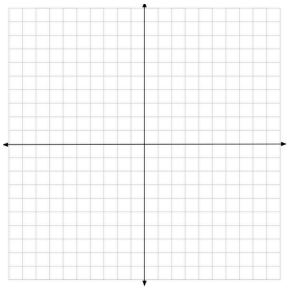
axis of symmetry:

vertex:

maximum/minimum:

domain:

range:



Ex. Without your graphing device, graph $y = -2x^2 + 2x - 5$.

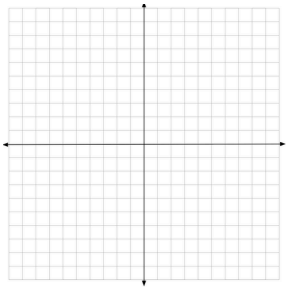
axis of symmetry:

vertex:

maximum/minimum:

domain:

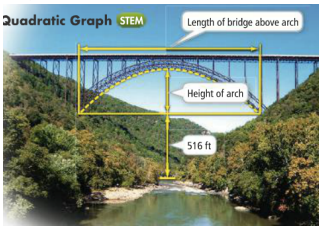
range:



Ex. What is the vertex form of $y = 2x^2 + 10x + 7$?

Ex. What is the vertex form of $y = -x^2 + 4x - 5$?

Ex. The New River Gorge Bridge in West Virginia is the world's largest steel single arch bridge. You can model the arch with the function $f(x) = -0.000498x^2 + 0.847x$, where x and y are in feet. How high above the river is the arch? How long is the section of bridge above the arch?



The Ahaozhou Bridge in China is the oldest known arch bridge dating to A.D. 605. You can model the support arch with the function $f(x) = -0.001075x^2 + 0.131148x$, where x and y are measured in feet. How high is the arch above its supports?