

Honors Algebra II

Notes Section 1.1

Graph Quadratic Functions in Standard Form

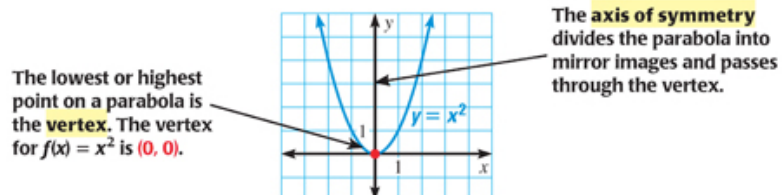
Quadratic Function: a function with a degree of 2

Standard Form: $y = ax^2 + bx + c$

Parabola: a graph of a quadratic function

Parent Function for Quadratic Functions

The parent function for the family of all quadratic functions is $f(x) = x^2$. The graph of $f(x) = x^2$ is the parabola shown below.



For $f(x) = x^2$, and for any quadratic function $g(x) = ax^2 + bx + c$ where $b = 0$, the vertex lies on the y -axis and the axis of symmetry is $x = 0$.

Vertex: lowest/highest point of a parabola ; $x = -b/2a$

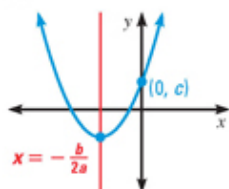
Axis of Symmetry: a line that divides a parabola into mirror images

Minimum Value: y -coordinate of the vertex of a parabola that opens up

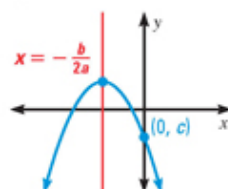
Maximum Value: y -coordinate of the vertex of a parabola that opens down

Properties of the Graph of $y = ax^2 + bx + c$

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



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



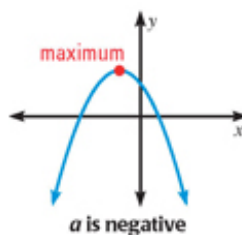
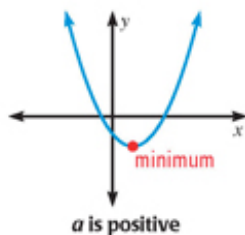
Characteristics of the graph of $y = ax^2 + bx + c$:

- The graph opens up if $a > 0$ and opens down if $a < 0$.
- The graph is narrower than the graph of $y = x^2$ if $|a| > 1$ and wider if $|a| < 1$.
- The axis of symmetry is $x = -\frac{b}{2a}$ and the vertex has x -coordinate $-\frac{b}{2a}$.
- The y -intercept is c . So, the point $(0, c)$ is on the parabola.

Minimum and Maximum Values

Words For $y = ax^2 + bx + c$, the vertex's y -coordinate is the **minimum value** of the function if $a > 0$ and the **maximum value** if $a < 0$.

Graphs



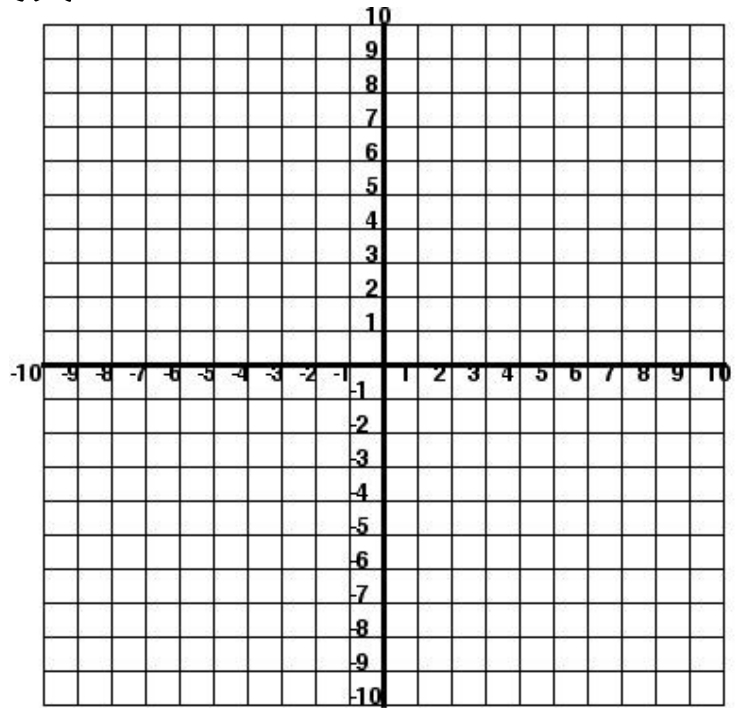
EXAMPLE 1

Graph and compare to $y=x^2$.

a) $y=2x^2$

x	y

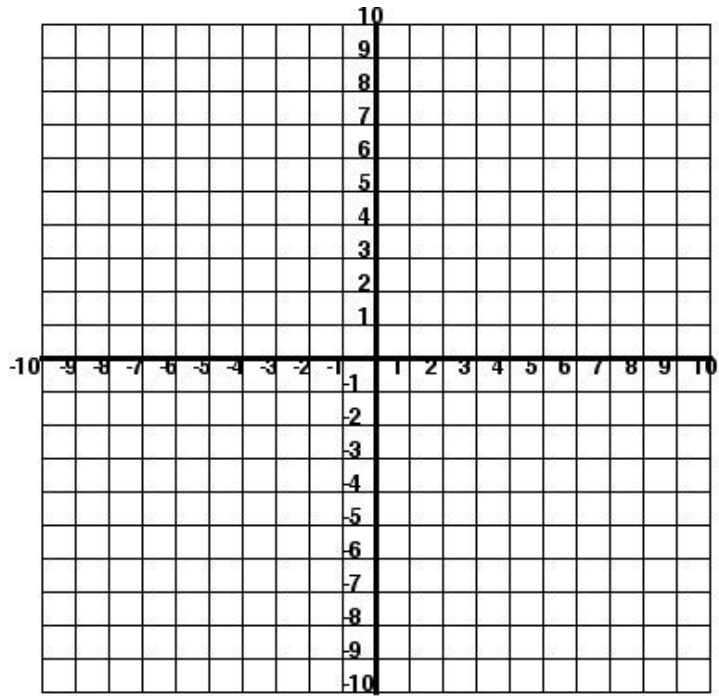
x	y



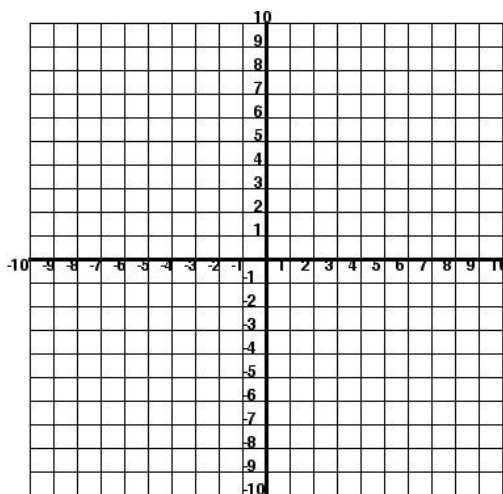
Comparison:

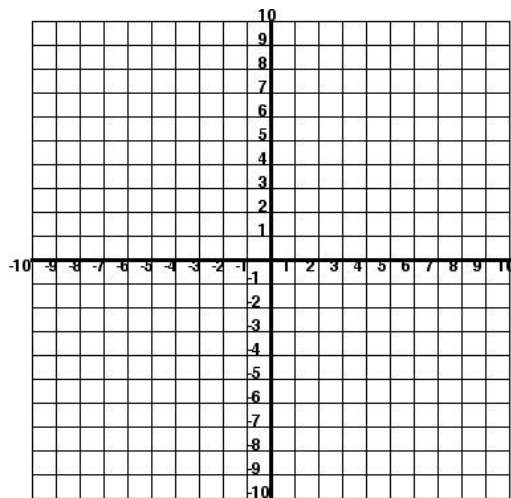
c) $y = -x^2 - 5$

x	y



Comparison:

EXAMPLE 2Graph. a) $y = 2x^2 - 8x + 6$ $a = \underline{\hspace{2cm}}$ $b = \underline{\hspace{2cm}}$ $c = \underline{\hspace{2cm}}$ **Step 1 (Find x-coordinate of the vertex)** $x = -b/2a$ **Step 2 (Find y-coordinate of the vertex)****Step 3 & 4 (Name Vertex & Line of Symmetry)** $V(\quad)$ $x = \underline{\hspace{2cm}}$ **Step 5 (Find the y-intercept)** Sub in Zero for X**Step 6 (Graph & Find Reflection Point)**

EXAMPLE 2Graph. **b) $y = -1/3x^2 - 5x + 2$** $a = \underline{\hspace{2cm}}$ $b = \underline{\hspace{2cm}}$ $c = \underline{\hspace{2cm}}$ **Step 1 (Find x-coordinate of the vertex)** $x = -b/2a$ **Step 2 (Find y-coordinate of the vertex)****Step 3 & 4 (Name Vertex & Line of Symmetry)** $V(\quad)$ $x = \underline{\hspace{2cm}}$ **Step 5 (Find the y-intercept)** **Sub in Zero for X****Step 6 (Graph & Find Reflection Point)**

EXAMPLE 3

Tell whether the function has a minimum/maximum value and then find it.

a) $y = 3x^2 - 18x + 20$

a = _____

a _____

_____ value

b) $y = -4x^2$

a = _____

a _____

_____ value

EXAMPLE 4

A go-cart track has about 380 racers per week and charges each racer \$35 to race. The owner estimates that there will be 20 more racers/week for every \$1 reduction in the price/racer. How can the owner maximize weekly revenue?

Revenue = Price X Attendance