Quadratic Functions and Graphs Video Lecture

Sections 11.5 and 11.6

Course Learning Objective:

Graph quadratic equations and model applications based on these equations and their graphs.

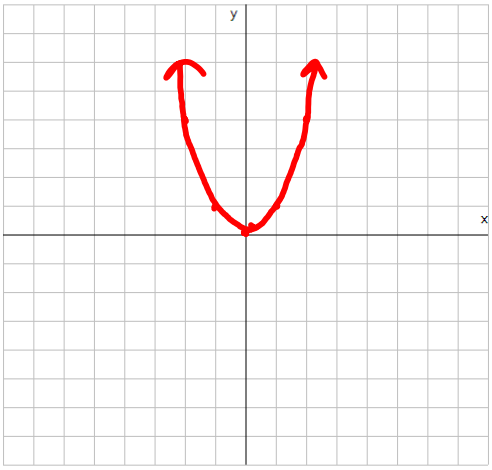
Weekly Learning Objectives:

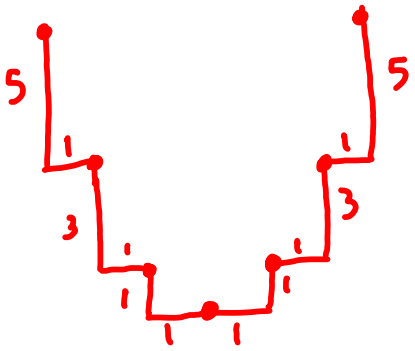
1) **Graph quadratic functions of the form $f(x) = x^2+k$.**
2) **Graph quadratic functions of the form $f(x) = (x-h)^2$.**
3) **Graph quadratic functions of the form $f(x) = (x-h)^2+k$.**
4) **Graph quadratic functions of the form $f(x) = a(x-h)^2+k$.**
5) **Graph quadratic functions of the form $f(x)=ax^2+bx+c$.**
6) **Find the vertex, axis of symmetry, domain, range, translations and intercepts of a quadratic function.**
7) **Write quadratic functions in the form $y= a(x-h)^2+k$.**
8) **Use the formula for finding the vertex of a parabola.**
9) **Find the minimum or maximum value of a quadratic formula.**

Quadratic Functions and Graphs

$f(x) = x^2$

Pattern:





Domain:

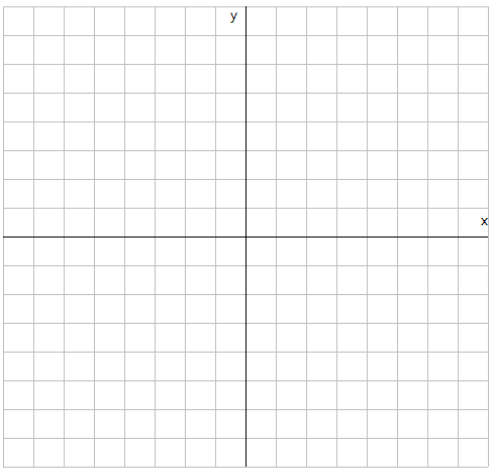
Range:

Vertex:

Minimum Value:

Axis of Symmetry:

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



Domain: **Range:**

Vertex: **Min Value:**

Axis of Symmetry:

Vertex Form of the Equation of a Parabola:

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

Vertex: (h, K)

Min/Max Value: K

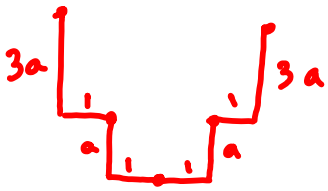
Axis of Symmetry: $x = h$

Domain: $(-\infty, \infty)$

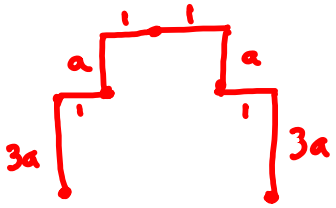
Range: $[K, \infty)$ if $a > 0$ or $(-\infty, K]$ if $a < 0$

Pattern:

$a > 0$



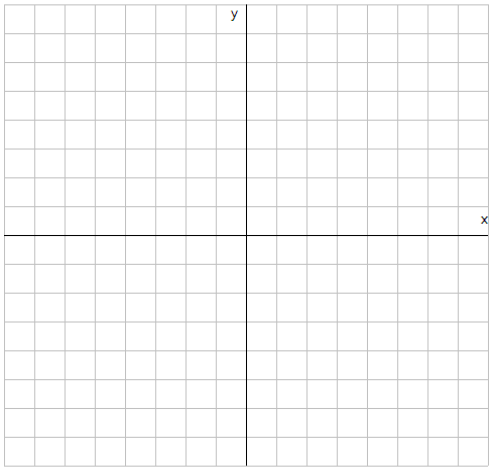
$a < 0$



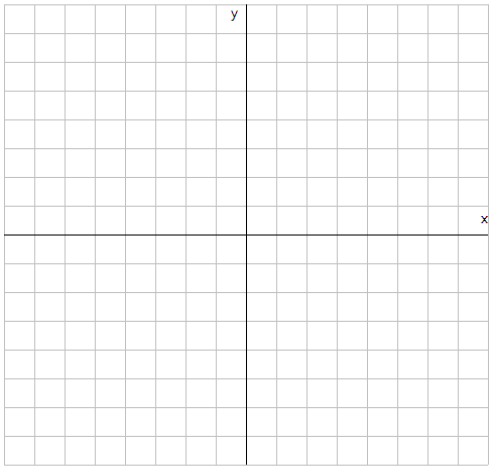
If $|a|>1$, then the graph gets narrower — **Vertical Stretch**

If $0<|a|<1$ (fractions), then the graph gets wider — **Vertical Compression**

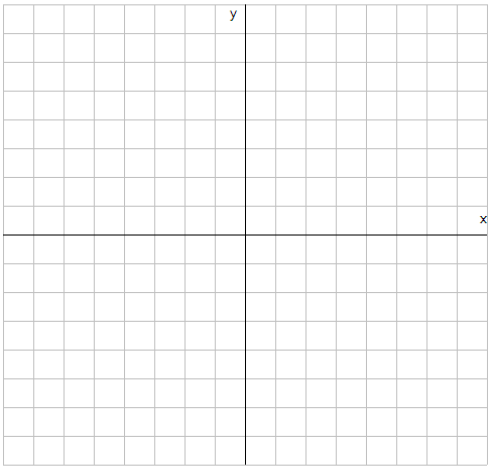
$$y = 3(x-3)^2 - 2$$



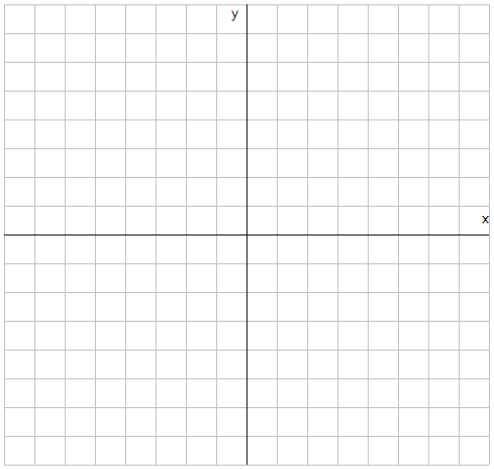
$$y = -2(x+1)^2 + 4$$



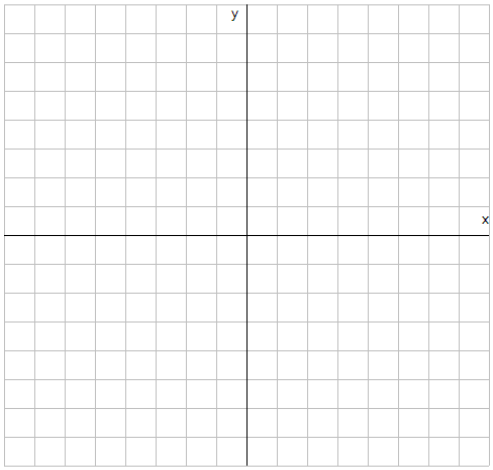
$y = \frac{1}{2}(x+2)^2 - 3$



$y = -\frac{1}{3}(x-1)^2 + 2$



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

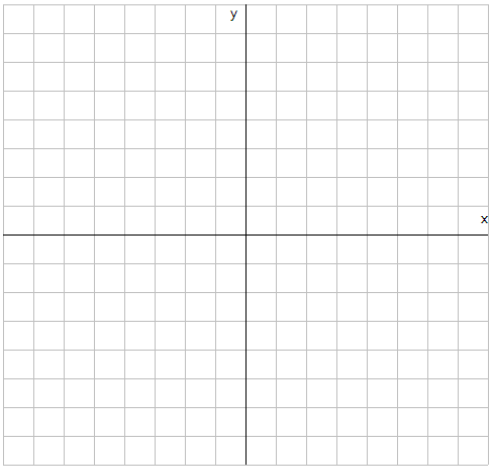


An alternate to finding the vertex:

To find the vertex of $f(x) = ax^2 + bx + c$

use the vertex formula: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$

$f(x) = 2x^2 + 4x + 5$



Vertex:

Domain:

Range:

Max/Min value:

x-intercepts:

y-intercept:

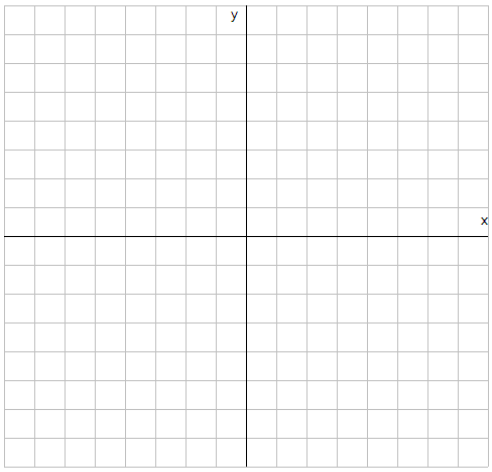
$f(x) = -x^2 - 2x + 3$

Vertex:

Domain:

Range:

Max/Min value:



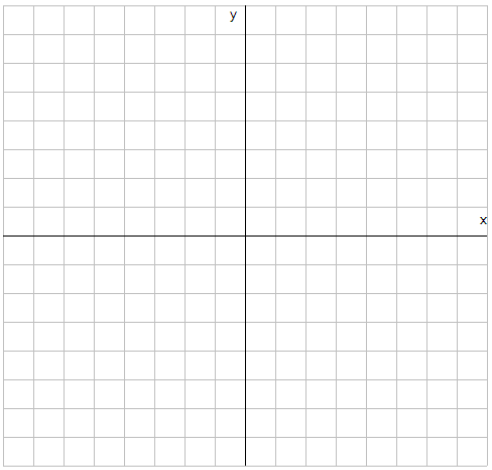
x-intercepts:

y-intercept:

$f(x) = \frac{1}{2}x^2 + 2x - 1$

Vertex:

Transformations:



If a projectile is fired straight upward from the ground with an initial speed of 96 feet per second, then its height h in feet after t seconds is given by the equation:

$$h(t) = -16t^2 + 96t$$

Find the maximum height of the projectile.

The Utah Ski club sells calendars to raise money. The profit P, in cents, from selling x calendars is given by equation $P(x) = 360x - x^2$

a) How many calendars must be sold to maximize profit?

b) What is the maximum profit?