

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.

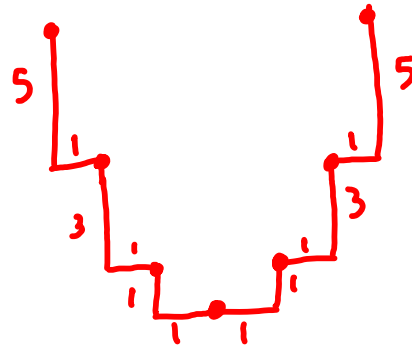
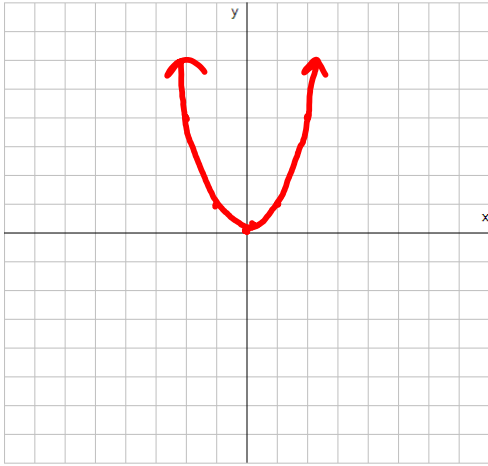
Weekly Learning Objectives:

- 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:

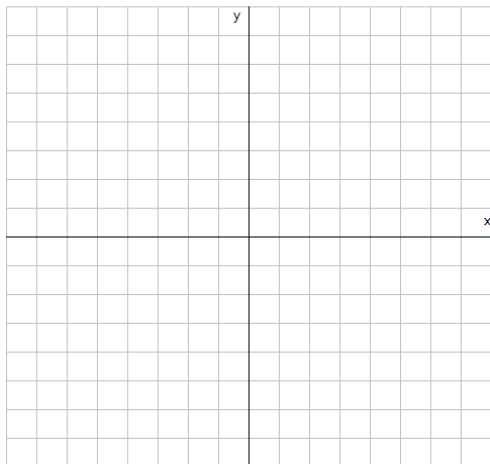
Range:

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)

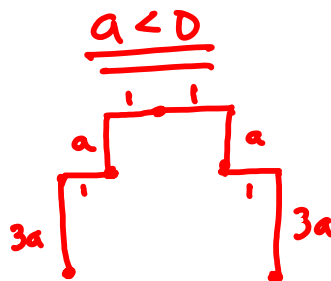
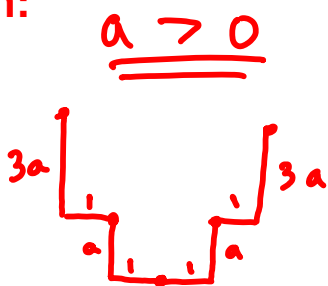
Min/Max Value: K

Axis of Symmetry: $x = h$

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

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

Pattern:



If $|a| > 1$, then the graph gets narrower

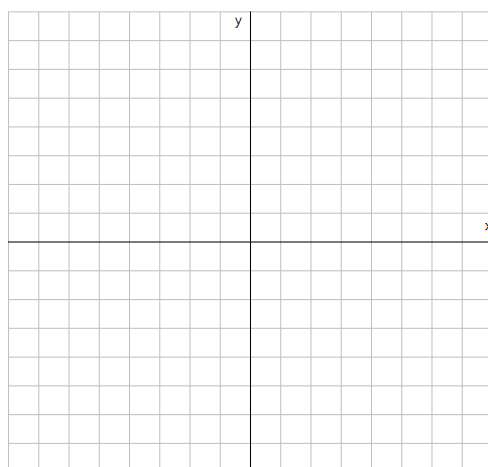
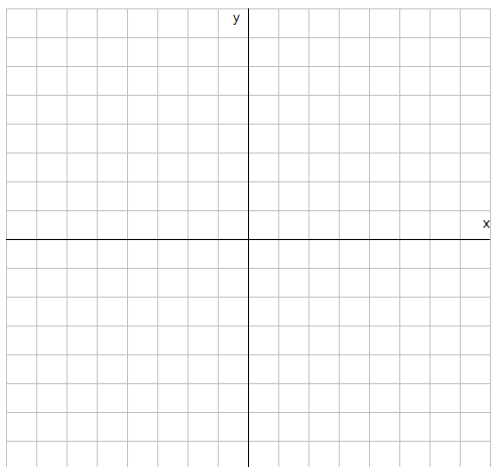
Vertical Stretch

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

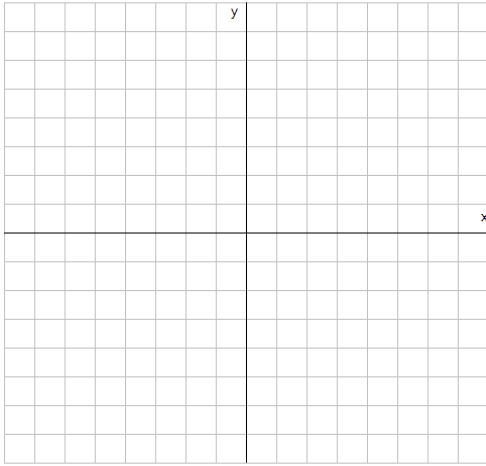
Vertical Compression

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

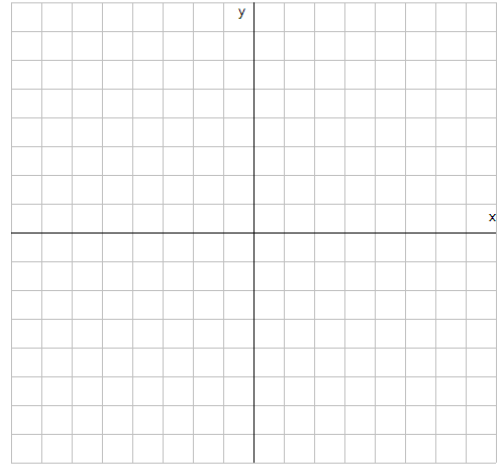
$$y = -2(x+1)^2 + 4$$



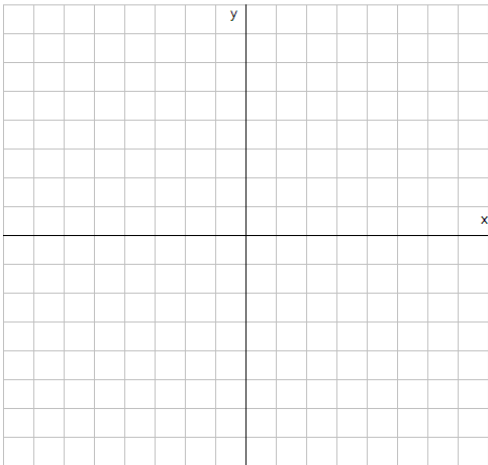
$$y = \frac{1}{2}(x+2)^2 - 3$$



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



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



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:

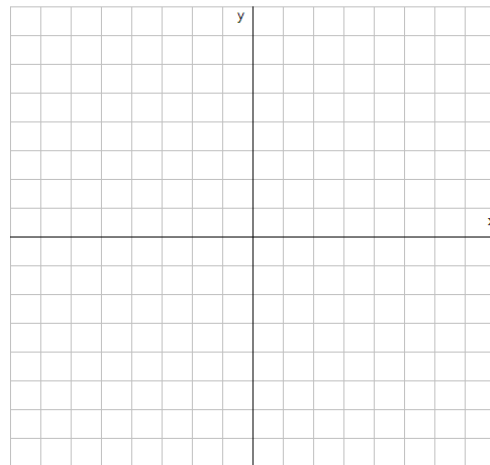
Domain:

Range:

Max/Min value:

x-intercepts:

y-intercept:



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

Vertex:

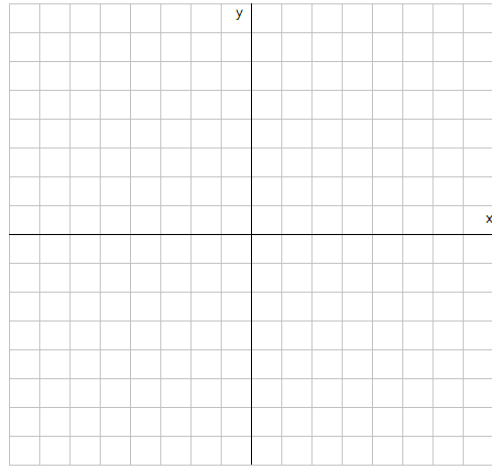
Domain:

Range:

Max/Min value:

x-intercepts:

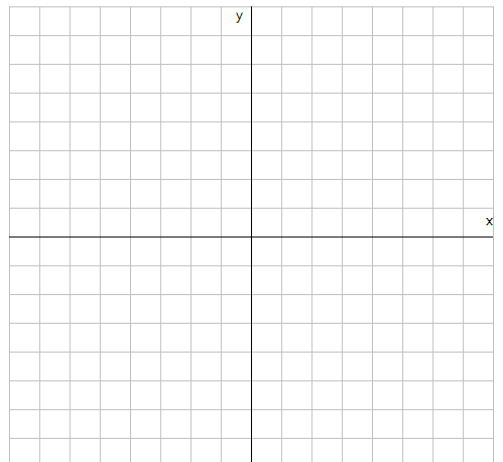
y-intercept:



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

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?