Another way to graph a parabola:

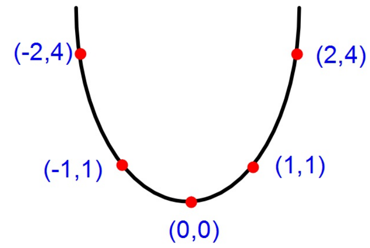
Step 1: Find the Vertex

$y = ax^2 + bx + c$

Step 2: Use the Vertical Stretch or Shrink Factor to find the remaining points.

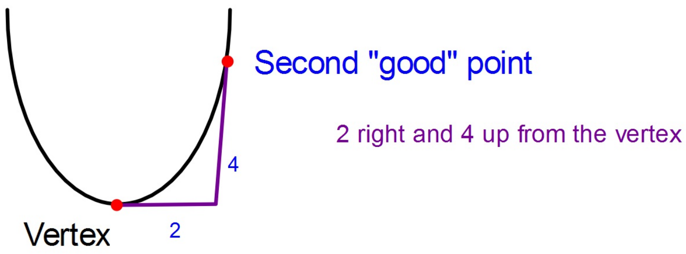
Parent Quadratic Function: $y = x^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



First "good" point after the vertex:

Second "good" point after the vertex:



Graph this Quadratic:

$y = 2x^2 + 16x + 26$

Opens: up

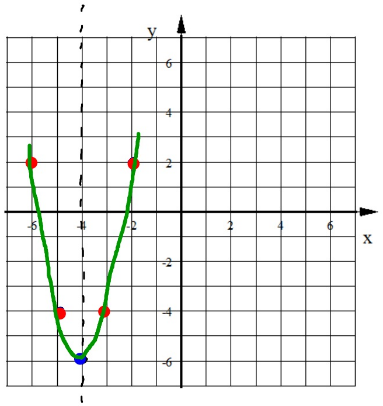
LOS: $X = \frac{-16}{4} = -4$

Vertex: $(-4, -6)$

Vertical Stretch Factor: 2

1st pt: 1 ⌋ 1 x 2 becomes 1 ⌋ 2

2nd pt: 2 ⌋ 4 x 2 becomes 2 ⌋ 8



Graph this Quadratic:

$y = x^2 - 4x - 1$

Opens: up

LOS: $X = \frac{4}{2} = 2$

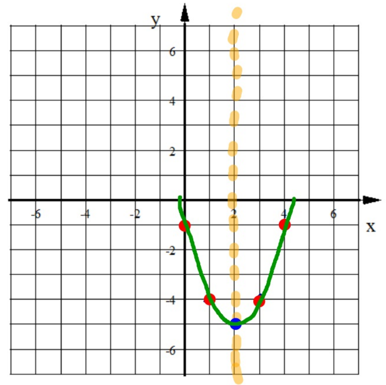
Vertex: $(2, -5)$

Vertical Stretch Factor: 1

Same shape/height as the parent function.

1st pt: 1 ⌋ 1

2nd pt: 2 ⌋ 4



$y = -2x^2 - 4x + 3$

Opens: Down

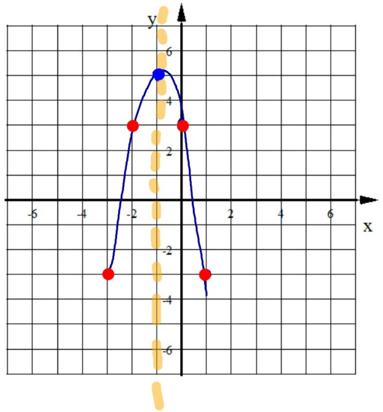
LOS: $X = \frac{4}{-4} = -1$

Vertex: $(-1, 5)$

Vertical Stretch Factor: -2

1st pt: 1 ⌋ 1 x -2 becomes 1 ⌉ -2

2nd pt: 2 ⌋ 4 x -2 becomes 2 ⌉ -8



Graph: $y = 2x^2 - 6$

Opens: up

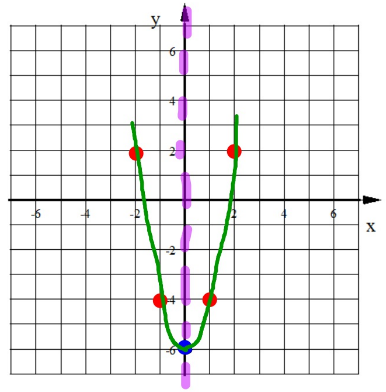
LOS: $X = 0$

Vertex: $(0, -6)$

Vertical Stretch Factor: 2

1st pt: 1 ⌋ 1 x 2 becomes 1 ⌋ 2

2nd pt: 2 ⌋ 4 x 2 becomes 2 ⌋ 8



Graph: $y = 3x^2 + 24x + 43$

Opens: up

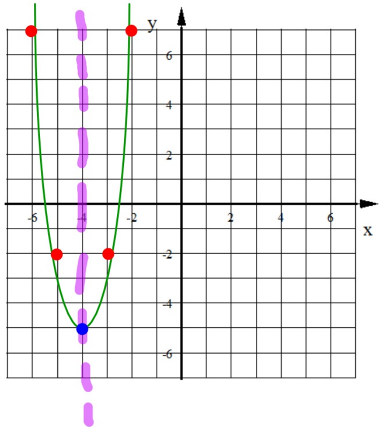
LOS: $\boxed{X = -4}$

Vertex: $(-4, -5)$

Vertical Stretch Factor: 3

1st pt: over 1, up 1×3 becomes over 1, up 3

2nd pt: over 2, up 4×3 becomes over 2, up 12



Use this Quadratic: $y = 2x^2 + 24x - 19$

since a is positive it opens up, therefore, the Vertex is a MIN

Does this Quadratic Function have a Maximum or a Minimum?

Find the Coordinates of the Vertex. LOS $X = \frac{-24}{4} = -6$

$(-6, -91)$

What is the Minimum of this function?

-91

When does the minimum occur?

when x = -6

Remember, the vertex of a parabola is either the maximum or the minimum of a quadratic function.

A company makes syringes. The following equation models their Profit as a function of the number of syringes made per hour.

$$P(s) = -0.45s^2 + 360s - 1250$$

vertex

LOS: $x = \frac{-360}{-.9}$

$(400, 70{,}750)$

X Y

S P

1. Find the number of syringes that should be made per hour in order to maximize the company's Profit.

400

2. What is the maximum Profit?

70,750

A company needs to minimize their costs. The equation below gives their weekly costs (C) as a function of the number of hours each employee works (h).

$$C(h) = 6.5h^2 - 455h + 7962.50$$

Find the minimum costs the company can incur and how many hours each employee should work to reach this minimum.

Vertex

(x, y)

(h, c)

$(35, 0)$

LOS: $x = \frac{455}{13} = 35$

hrs = 35 hr

Cost = $0

A ball is shot into the air with an initial velocity of 80 ft/sec from the top of a 50 ft tall building. The following equation models the height (ft) of the object as a function of time (sec).

$$h(t) = -16t^2 + 80t + 50$$

find the vertex!

LOS: $x = \frac{-80}{-32}$

$x = 2.5$

$(2.5, 150)$

t h

1. Find the time it takes the object to reach its maximum height.

2.5 seconds

2. Find the maximim height of the object.

150 ft

Use this Quadratic Function $f(x) = 2x^2 - 3x + c$

This quadratic passes through the point (-1,13).

x y

Find c.

$13 = 2(-1)^2 - 3(-1) + c$

$13 = 2 + 3 + c$

$13 = 5 + c$

$8 = c$

Find the quadratic function $y = ax^2 + c$ that passes through the given points:

(2, -9) and (-3, -34)

$-9 = 4a + c$

$-\ -34 = 9a + c$

$25 = -5a$

$a = -5$

$-9 = 4(-5) + c$

$-9 = -20 + c$

$11 = c$