

Unit 3: Graphing an Equation of the form $y = ax^2$ (Equation to find the max or min) \rightarrow always has a vertex of $(0, 0)$

ex. graph

$$y = ax^2 + bx + c$$

To graph:

$$y = x^2$$

$$y = 1 \cdot x^2$$

Step ①: Find the vertex using the vertex formula

$$V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$$

$$\Delta = b^2 - 4ac$$

$$a = 1$$

$$b = 0$$

$$c = 0$$

$$\Delta = 0^2 - 4(1)(0)$$

$$\Delta = 0$$

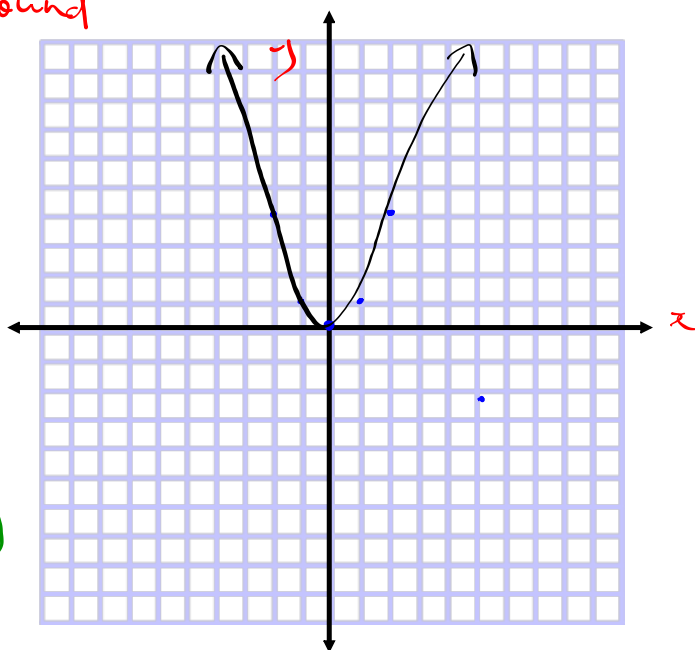
$$V\left(\frac{-0}{2(1)}, \frac{-0}{4(1)}\right)$$

$$V(0, 0)$$

Step ②: Construct a table of value and put the vertex in the middle. Pick symmetric x values that surround the vertex.

x	$y = x^2$
-2	$(-2)^2 = 4$
-1	$(-1)^2 = 1$
0	0
1	$(1)^2 = 1$
2	$(2)^2 = 4$

V \rightarrow



Step ③ Find the corresponding y values by using the formula (sub in the x values). Then plot the points.

graph $y = ax^2 + bx + c$

$y = -2x^2$

$a = -2$

$b = 0$

$c = 0$

Step ①: Find the vertex

$\Delta = b^2 - 4ac$

$\Delta = 0^2 - 4(-2)(0)$

$\Delta = 0 + 8(0) = 0$

$V\left(\frac{-b}{2a}, \frac{-\Delta}{4a}\right)$

$V(0, 0)$

Step ② $y = -2x^2$

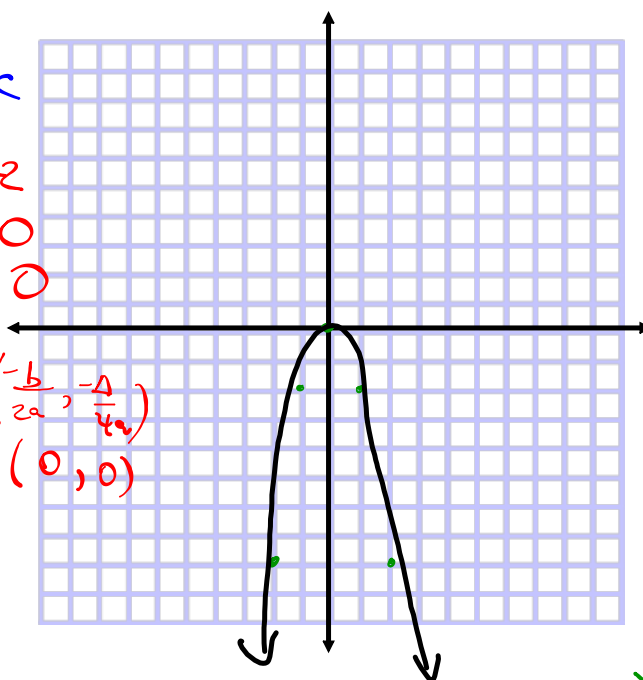
To V

x	y
-2	$-2x^2 = -2(-2)^2 = -8$
-1	$-2x^2 = -2(-1)^2 = -2$
0	0 =
1	$-2x^2 = -2(1)^2 = -2$
2	$-2x^2 = -2(2)^2 = -8$

V →

Step ③:

Find the y values by using the equation
Plot points



(x, y)

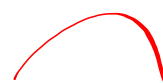
Nota Bene: $y = ax^2 + bx + c$

the 'a' parameter tells
you whether the parabola
is facing up or down

'a' is positive



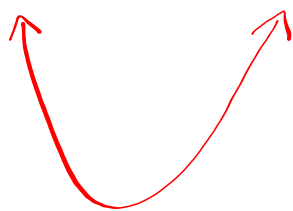
'a' is negative



$$y = 2x^2$$

$$y = 4x^2$$

$$y = 8x^2$$



plus le 'a' est grand,
 plus le ^{parabole} graphique est
 étroit.

$$y = 4x^2$$

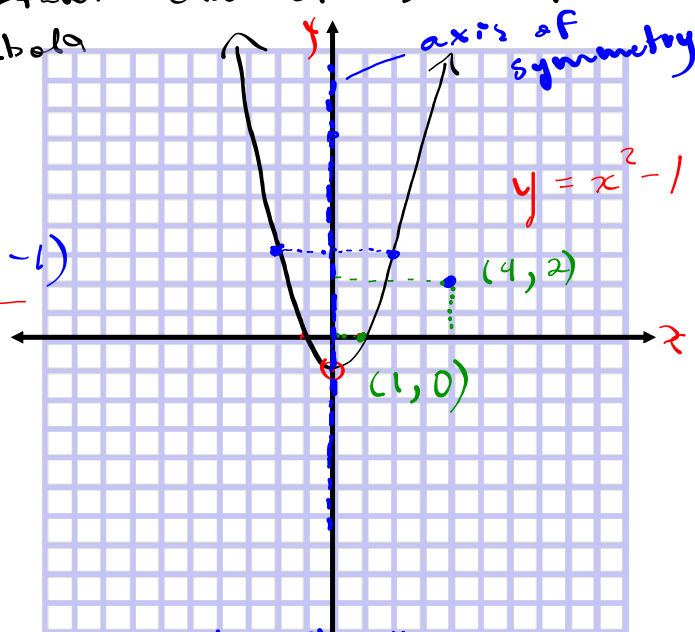
$$y = x^2$$

$$y = 0.5x^2$$

→ as 'a' gets smaller (but not negative)
 the parabole gets wider.

The 5 important characteristics of a parabola

- ① Vertex (x, y)
 $(0, -1)$
- ② The coordinates of the y-intercept $(0, -1)$
(the point the intercepts the y-axis)
 $(0, c)$
- ③ The coordinates of the x-int(s)
 $(-1, 0)$ $(1, 0)$
- ④ The point symmetric (mirror point) with $(2, 3)$
 $(-2, 3)$



- ⑤ imaginary (line) axis of symmetry
 $x = \frac{-b}{2a}$
 $x = 0$

1.
2.
3.
4.
5.

① Vertex _____

② y int _____

③ x-int(s) _____

④ the point symmetric to y-int _____

⑤ axis of symmetry _____