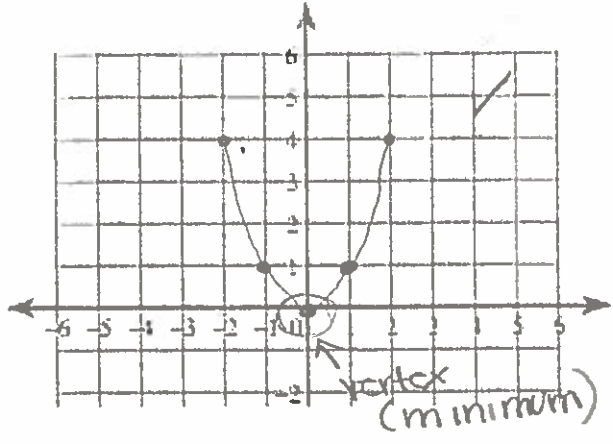


Quadratic Functions

The simplest quadratic function is the *quadratic parent function*, $f(x) = x^2$ or $y = x^2$.

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



What do you notice about the table?
 - x-values went (-) to (+)
 - y-value dec. then inc + repeat
 - not constant ROC

What do you notice about the graph?
 U-shaped parabola
 Smooth Curve
 Nonlinear

Key Vocabulary:

(highest point or lowest point)

The Vertex is the maximum or minimum of the graph.

The axis of symmetry is the line dividing the parabola into 2 equal halves.

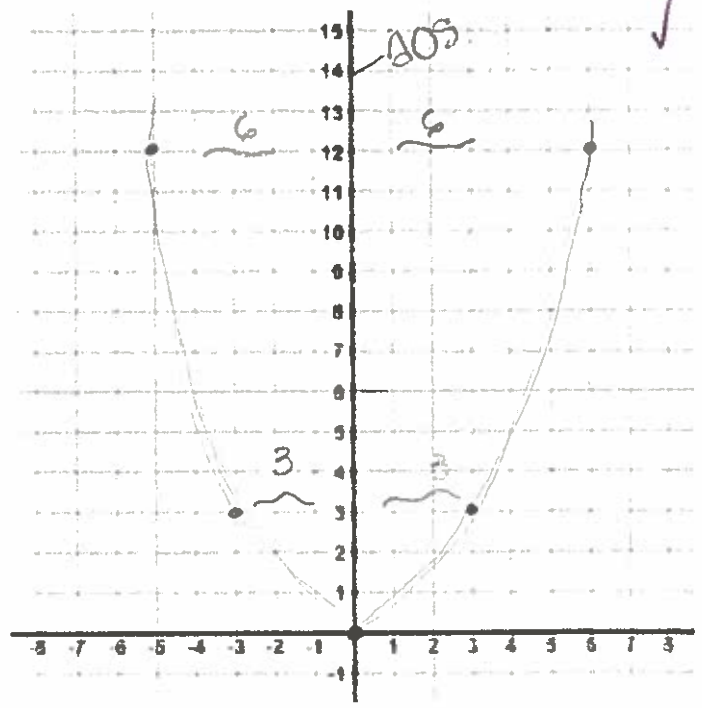
Graphing $y = ax^2$

Ex. 1 $y = \frac{1}{3}x^2$

x	$\frac{1}{3}(x)^2$	y	$f(x) = y$	(x, y)
3	$\frac{1}{3}(3)^2$	3	$f(3) = 3$	$(3, 3)$
6	$\frac{1}{3}(6)^2$	12	$f(6) = 12$	$(6, 12)$
0	$\frac{1}{3}(0)^2$	0	$f(0) = 0$	$(0, 0)$

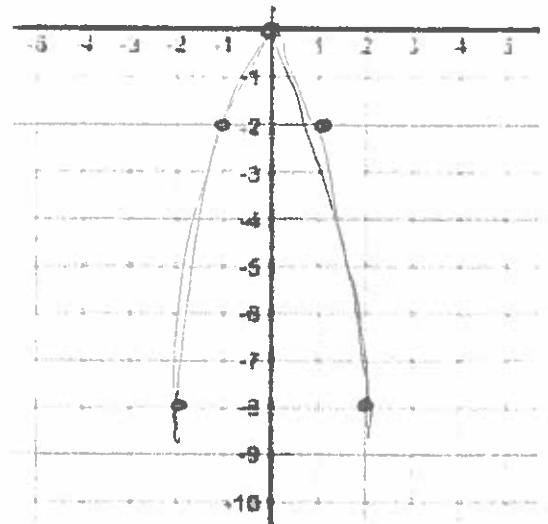
What are good values to choose for x? Why?
 # 's that go by 3
 b/c of $\frac{1}{3}$

How do we get the other side of the parabola?
 Count boxes to make the U-shape
 equal or even on both sides
 of the AOS
 (symmetrical)



You Try 2 $y = -2x^2$

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



What is the ordered pair of the vertex?

(0, 0) maximum
(highest point)

How does the "a" value affect the quadratic parent function? $f(x) = ax^2$

Graph	Opens Where?	Type of Vertex?	Pattern?	Sign of a?
Ex. 1 $\frac{1}{3}x^2$	up	minimum (lowest point)	dec to inc	Positive + + $(\frac{1}{3})$ ☺
You Try 2 $-2x^2$	down	maximum (highest point)	inc to dec	negative - - -2 ☹

Graph	Wider vs. Narrower than $f(x) = x^2$	Fraction vs. Integer for a?
Ex. 1 $\frac{1}{3}x^2$	wider	fraction
You Try 2 $-2x^2$	narrow	integer

Key Idea

- The a value affects the width and open direction.

Match the function with its description in comparison to the parent function.

- | | | |
|----------------------------|------------------|------------------------------|
| 1) C $y = 3x^2$ | ----- | a. opens upward & wider |
| 2) A $y = \frac{1}{4}x^2$ | ----- | b. opens downward & wider |
| 3) B $y = -\frac{2}{3}x^2$ | ----- | c. opens upward & narrower |
| 4) D $y = -4x^2$ | ----- | d. opens downward & narrower |

