Quadratic Functions

- non-linear
- $f(x) = Ax^2 + Bx + C$

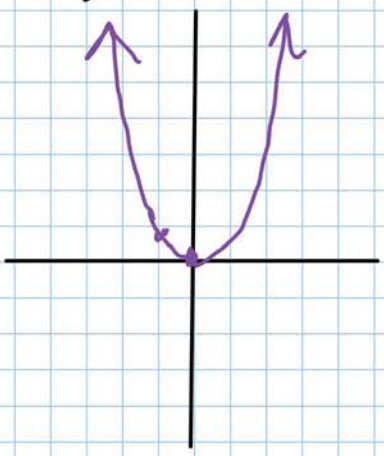
standard Form

where $A \neq 0$.

Linear Functions

- Linear
- $y = mx + b$
- Shape: Line

- Shape of a quadratic function graph is called a parabola



- Parabolas are symmetric about central line called the Axis of Symmetry (AoS)
  - always a vertical line $x = c$ for some number c
  - Not a real line (Not part of graph) so we graph it with a dotted line.

- AoS only intersects the parabola graph at one point, called the vertex

↳ where the graph changes direction

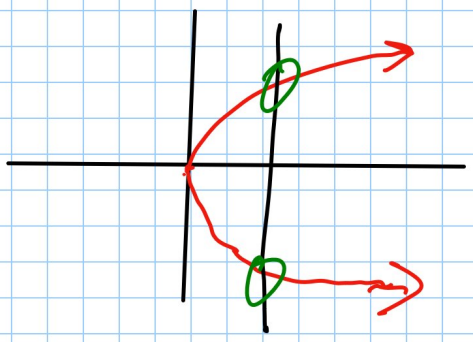
↳ Either the highest point (max) or lowest point (minimum)

(Absolute max/min)

Side Note:

- In Algebra 1, Parabolas are always up or down.

But parabolas can also open to the side.

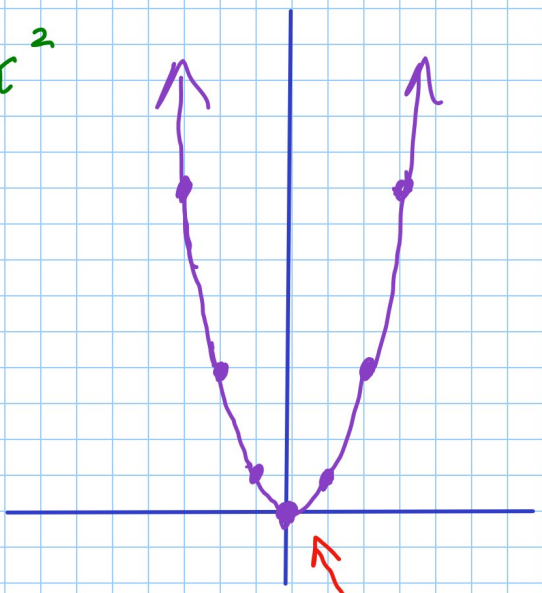


Not a function

(Fails VLT)

Parent Function: $f(x) = x^2$

x	$f(x) = x^2$
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9



$A = 1$
$B = 0$
$C = 0$

vertex: $(0,0)$

AoS: $x = 0$

Domain: $\mathbb{R}$ $(-\infty, \infty)$

Range: $[0, \infty)$ $y \geq 0$

Axis of Symmetry: $\boxed{x = \frac{-B}{2A}}$

↳ x-value of the vertex

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

X , Y ← Plug the x-value into the original function.

Parabolas either open up or down

- Depends on A

If $a > 0$

- parabola opens up
- vertex is the minimum
- Range: $y \geq$ y-value of vertex

$$[\text{y-value of vertex}, \infty)$$

If $a < 0$ (negative)

- parabola opens down
- vertex is the maximum
- Range: $y \leq$ y-value of vertex

$$(-\infty, \text{y-value of vertex}]$$

Ex: $f(x) = -2x^2 + 4x + 6$

$A = -2 \quad B = 4 \quad C = 6$