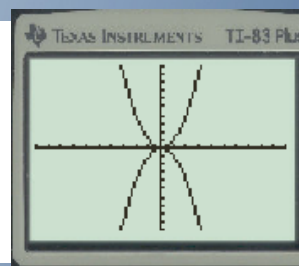


Vertex Form..

$$y = a(x - h)^2 + k$$

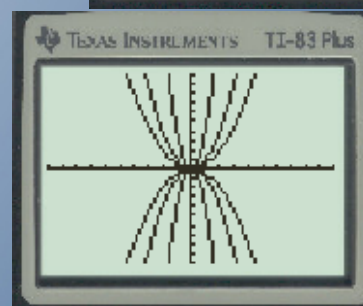
Direction of Opening: (“Look at the sign of the stretch factor”)

- If $a > 0$, then the graph opens upward.
- If $a < 0$, then the graph opens downward.



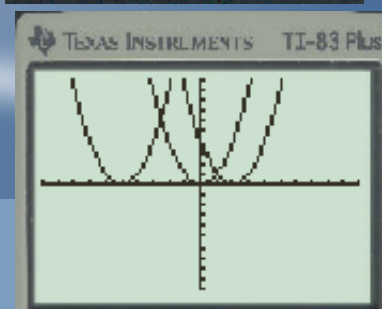
Vertical Stretch: (“Look at the magnitude of the stretch factor”)

- If $|a| > 1$, then the graph becomes narrower.
- If $|a| = 1$, then the graph stays the same.
- If $0 < |a| < 1$, then the graph becomes wider.



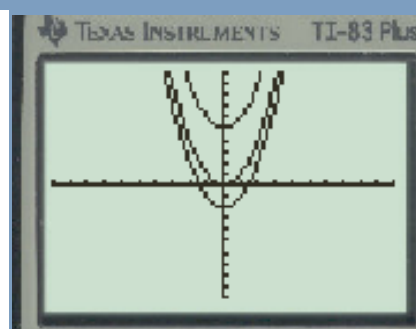
Horizontal Translation: (“Think opposite”)

- If $h > 0$, then the graph moves to the right h units.
- If $h = 0$, then the graph does not move horizontally.
- If $h < 0$, then the graph moves to the left h units.



Vertical Translation: (“Exactly the same”)

- If $k > 0$, then the graph moves upward k units.
- If $k = 0$, then the graph does not move vertically.
- If $k < 0$, then the graph moves downward k units.



HOMEWORK EXERCISE:

$$y = a(x - h)^2 + k$$

Sign $\rightarrow a$

Value of a

h

k

OPEN UP?
OPEN DOWN?

NARROW?
WIDER?

LEFT?
RIGHT?

UP?
DOWN?

Plot1	Plot2	Plot3				
$y_1 = x^2$			UP	no change	no	no
$y_2 = -2x^2 + 5$			DOWN	Narrow	no	US
$y_3 = 0.5(x - 3)^2 - 4$			UP	wider	R 3	04
$y_4 = 5x^2$			UP	narrow	no	no
$y_5 = -1/2(x + 7)^2 + 2$			DOWN	wider	L 7	U 2
$y_6 = 7(x - 1)^2 - 22$			UP	Narrow	R 1	022

Warm up . . .

a) $y = -\frac{2}{3}x^2 + 7$

b) $y = 4(x-2)^2 - 3$

	opens	narrow wide	L/R	u/D
a)	Down	wide	none	u7
b)	UP	narrow	R2	D3

ALL Properties of a Quadratic

$$y = a(x - h)^2 + k$$

✓ TRANSFORMATIONS...

- stretch factor 'a' --> direction of opening & shape
- translations 'h' and 'k' --> horizontal / vertical movements

• KEY POINTS...

- vertex (h, k) --> lowest / highest point on the parabola
- x intercept(s) --> where the graph crosses the x axis
 - > let $y = 0$ and solve for x
 - (we will come back to this property)**
- y intercept --> where the graph crosses the y axis
 - > let $x = 0$ and solve for y
 - > is the 'c' value in standard form

• PROPERTIES...

- Domain --> describes all possible x values
 - > for quadratic functions $\{x \in \mathbb{R}\}$
- Range --> describes all possible y values
 - > depends on direction of opening and "k" value in vertex
- Maximum / Minimum Value --> highest / lowest y value
 - > depends on direction of opening and "k value)
- Axis of symmetry --> vertical line of symmetry through vertex
 - [A.O.S] --> described through $x = h$