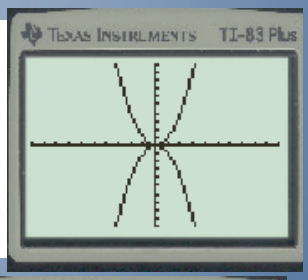
Vertex Form...

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

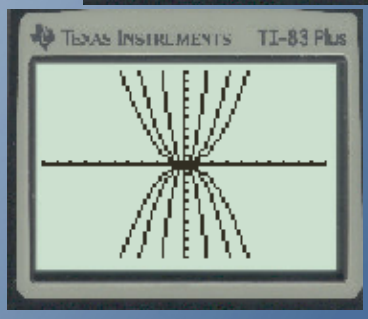
Direction of Opening: ("Look at the sign of the stretch factor")

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



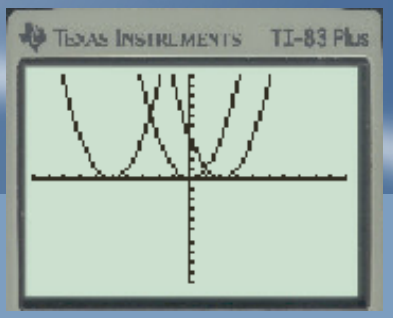
Vertical Stretch: ("Look at the magnitude of the stretch factor")

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



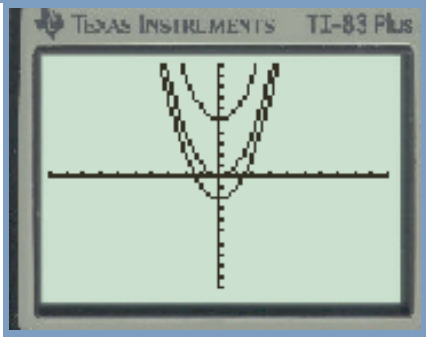
Horizontal Translation: ("Think opposite")

- 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*.

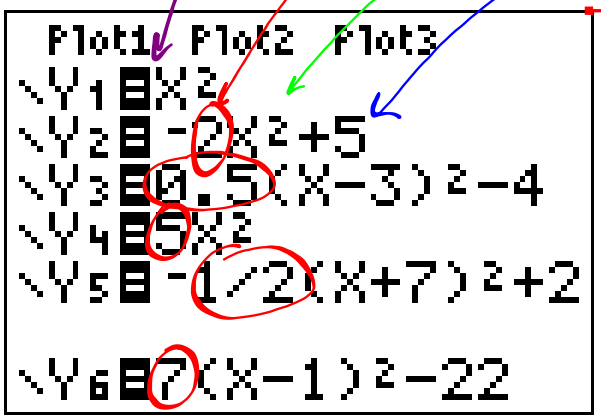


Vertical Translation: ("Exactly the same")

- 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:



opposite

same

OPEN UP? OPEN DOWN?	NARROW? WIDER?	LEFT? RIGHT?	UP? DOWN?
up	same	no move	no move
Down	narrow	no move	up 5
up	wider	right 3	down 4
up	narrow	no move	no move
Down	wider	Left 7	up 2
up	narrower	Right 1	down 22

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 $\{x \in R\}$
- 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

Properties...

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

$Y_6 = 7(X-1)^2 - 22$

a value, h, k

up | narrower | Right 1 | down 22

vertex $(1, -22)$

Stretch factor $\Rightarrow$ always positive

$|a|$ ← Absolute Value (makes positive)

Vertex $\Rightarrow (h, k)$

y-intercept $\Rightarrow$ let $x = 0$ & solve for y

$y = 7(0-1)^2 - 22$

$= 7(1) - 22$

$y = -15$

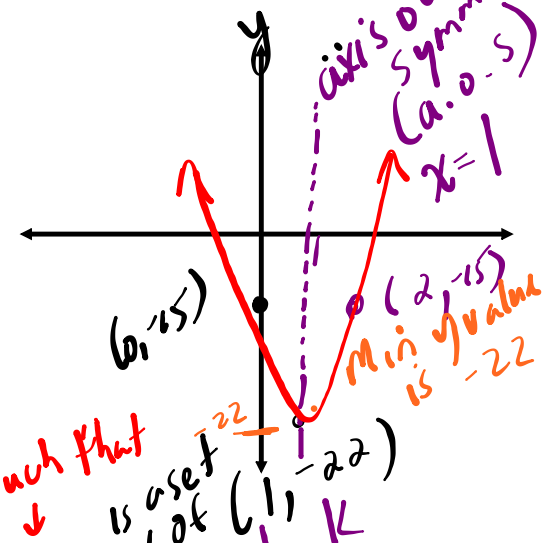
$(0, -15)$

* BEDMAS

Sketch: 1) vertex
2) y int
3) Reflect A.O.S

*must label your points

$(2h, y_{int})$



* such that

is a set of

$D: \{x \mid x \in R\}$

$R: \{y \mid y \geq -22, y \in R\}$

Min $\Rightarrow$ opens up
y-values
Max $\Rightarrow$ opens down

A.O.S $\Rightarrow$ $x = h$

Example: $y = -2(x+1)^2 - 3$

Transformations

- opens down
- narrow

→ stretch factor → 2

- left 1
- down 3

→ vertex $(-1, -3)$

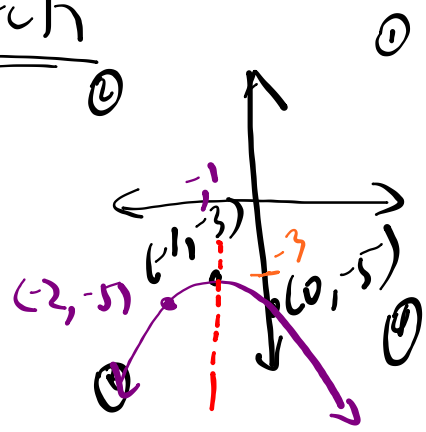
y-int

$y = -2(0+1)^2 - 3$

$y = -2 - 3$

$y = -5$ $(0, -5)$

Sketch



D: $\{x \in R\}$

R: $\{y \leq -3\}$

Max y-value is -3

A.O.S $\Rightarrow x = -1$

Forms of the Quadratic Function

Vertex Form

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

- stretch factor: "a"
- vertex: (h, k)

Properties →
- max/min y value
- axis of symmetry
- domain/range

Standard Form

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

- stretch factor: "a"
- y intercept: (0, c)

Example 1: Change from vertex to standard form.

Vertex Form $y = -3(x-2)^2 + 5$

↓

Standard

HOMEWORK...

Worksheet - Properties of Quadratics.docx

Attachments

Worksheet - Properties of Quadratics.docx