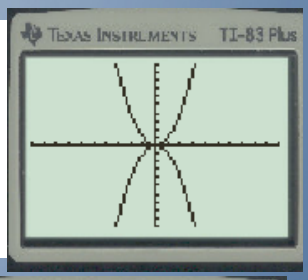
Vertex Form...

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

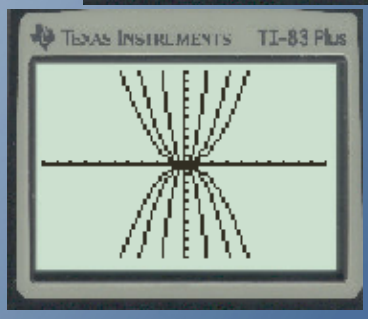
Direction of Opening: ("Look at the sign of the stretch factor")

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



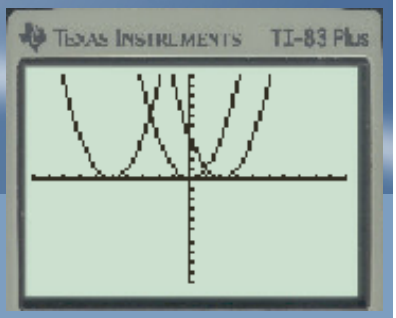
Vertical Stretch: ("Look at the magnitude of the stretch factor")

- 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*.



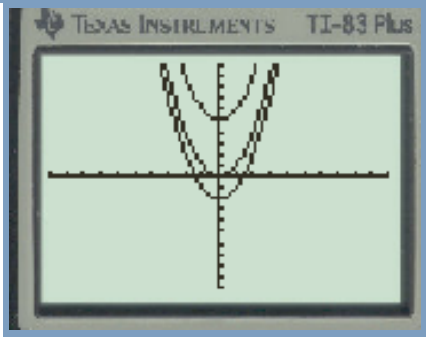
Horizontal Translation: ("Think opposite")

- 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*.

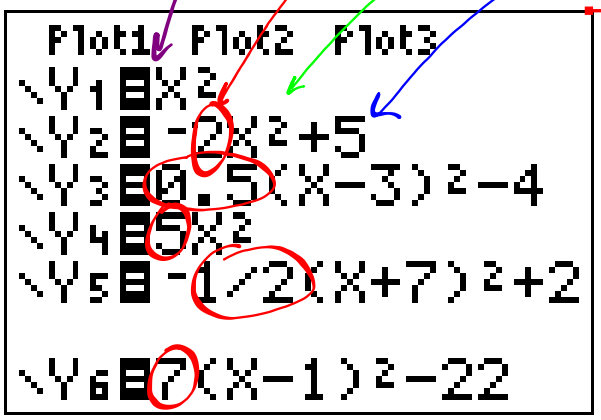


Vertical Translation: ("Exactly the same")

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

$Y_6 = 7(X-1)^2 - 22$ | up | narrower | Right 1 | down 22

vertex $(1, -22)$

- stretch factor (sf)

$|a|$ → always positive

$sf = 7$

- vertex (h, k)
- y-intercept → let $x = 0$ & solve for y

* BEDMAS

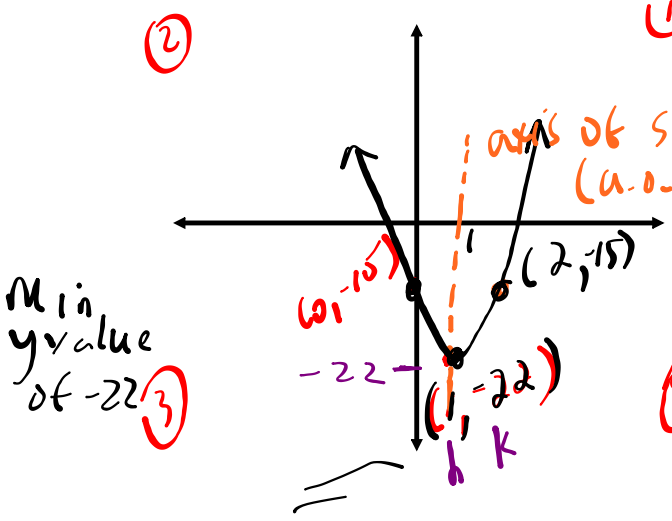
$y = 7(0-1)^2 - 22$

$y = 7(1) - 22$

$y = -15$

$(0, -15)$

① ② ③ ④



Min y value of -22

* Label Points

- Sketch: Need...
  1) vertex
  2) y-int ↓Reflection
  3) $(2h, y\text{-int})$

④ "such that" "belongs to"

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

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

Min → opens up

y value

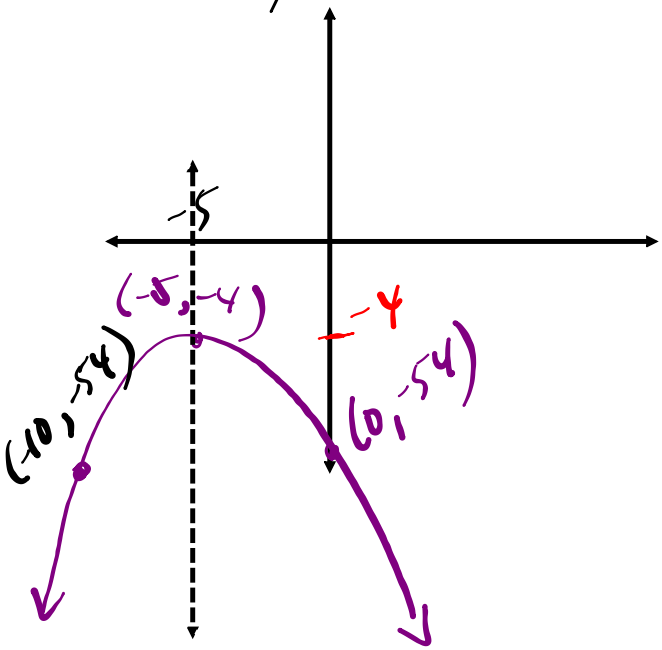
Max → opens down

a.o.s → $x = h$

Example : $y = -2(x+5)^2 - 4$

Transformations

- opens down
- narrower
- left 5
- down 4



Properties

s.f. → 2

✓ vertex → (-5, -4)

* y-int $y = -2(0+5)^2 - 4$

✓ (0, -54) $y = -2(25) - 4$

$y = -54$

- a.o.s $x = -5$
- max y-value is -4
- Domain $\{x \in R\}$
- Range: $\{y \leq -4\}$

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