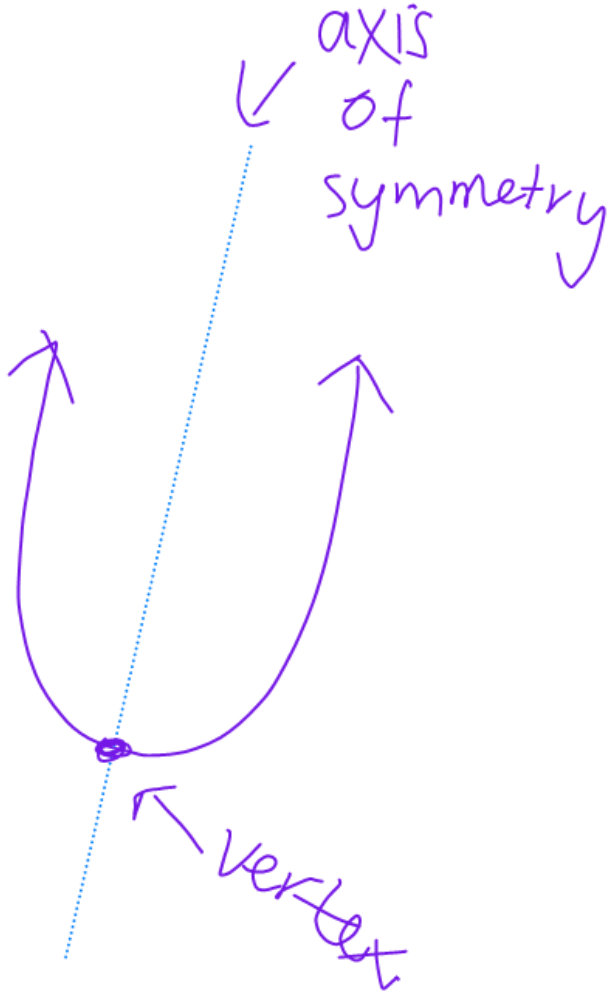
10.2 - Quadratic Functions

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

- Quadratic Function
- ~~Standard Form~~
- Axis of Symmetry
- Vertex
- y-intercept Where the graph crosses the "y" axis
- inequality



1. find axis of symmetry $x = \frac{-b}{2a}$
2. find vertex (x, y)
3. find y-int → subst. 0 for x
4. find 1 more point

$ax^2 + bx + c$

Find the axis of symmetry: $2x^2 + 4x - 3$

$a = 2$

$b = 4$

$c = -3$

$x = \frac{-4}{2 \cdot 2} = \frac{-4}{4} = -1$

$x = -1$

Axis of symmetry: $x = \frac{-b}{2a}$

Find the vertex: $2x^2 + 4x - 3$

* Plug a of S in equation for $x = -1$

$y = 2(-1)^2 + 4(-1) - 3$

$2 + -4 - 3$

$-2 - 3$

-5

Vertex

$(-1, -5)$

Find the y-intercept:

$2x^2 + 4x - 3$

*Plug in 0 for x & solve for y.

(0, c)

$2(0)^2 + 4(0) - 3$

(0, -3)

1 EXAMPLE Graph the function $y = 2x^2 + 4x - 3$.

$x = 1$

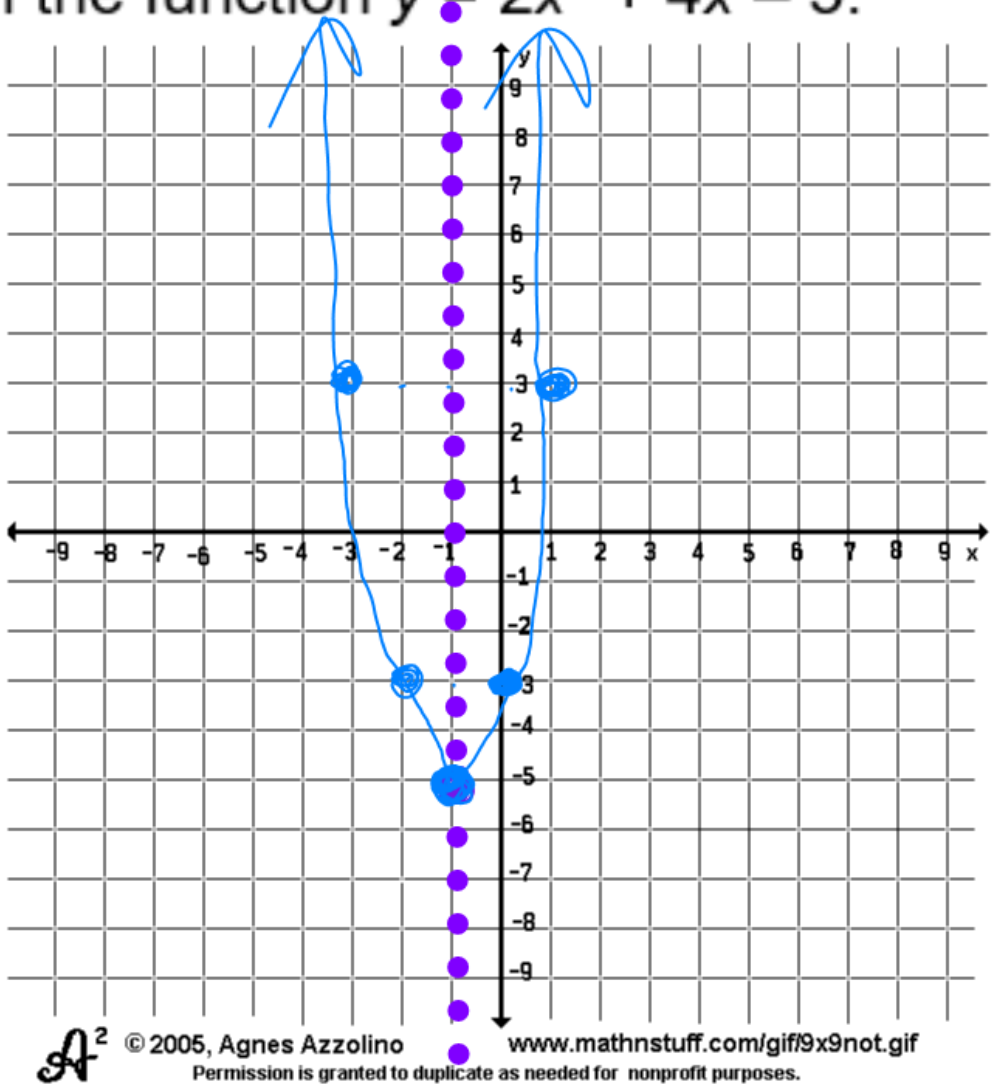
$y = 2(1)^2 + 4(1) - 3$

$y = 2 + 4 - 3$

$y = 6 - 3$

$y = 3$

$(1, 3)$

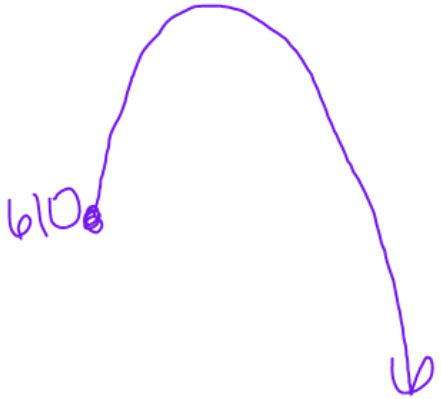


2 EXAMPLE Aerial fireworks carry "stars," which are made of a sparkler-like material, upward, ignite them, and project them into the air in fireworks displays. Suppose a particular star is projected from an aerial firework at a starting height of 610 ft with an initial upward velocity of 88 ft/s. How long will it take for the star to reach its maximum height? How far above the ground will it be?

vertex

$y = ax^2 + bx + c$

$\rightarrow y = -16x^2 + 88x + 610$



$x = \frac{-b}{2a} = \frac{-88}{2(-16)} = \frac{+88}{32} = 2.75$

$y = -16(2.75)^2 + 88(2.75) + 610$

$= -121 + 242 + 610$

$= 731$ ft.

(2.75, 731)

↑ Secs. ↑ ft.

$>$ $<$ → dashed $\geq$ $\leq$ → solid

3 EXAMPLE Graph the quadratic inequality $y \geq -x^2 + 6x - 5$.

$y = -1x^2 + 6x - 5$

① axis of symm.

$x = \frac{-b}{2a} = \frac{-6}{2(-1)} = \frac{-6}{-2} = 3$

② vertex

$y = -(3)^2 + 6(3) - 5$

$-9 + 18 - 5$ (3, 4)

$9 - 5 = 4$

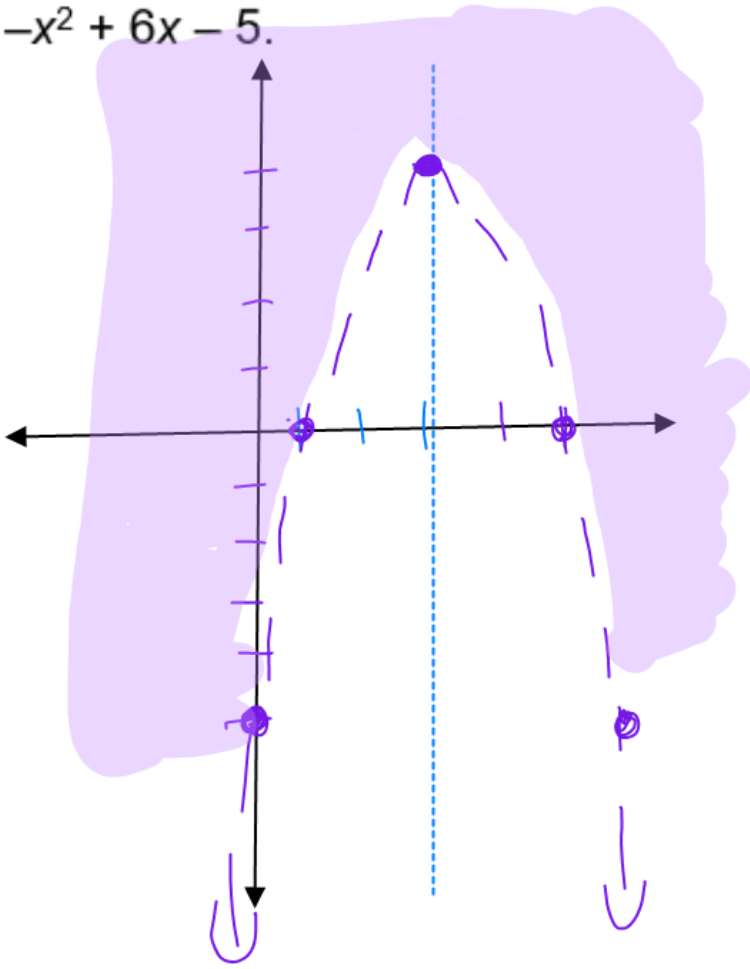
③ y-int. ~~$-0^2 + 6(0)$~~ -5

④ $x = 1$ $-(1)^2 + 6(1) - 5$

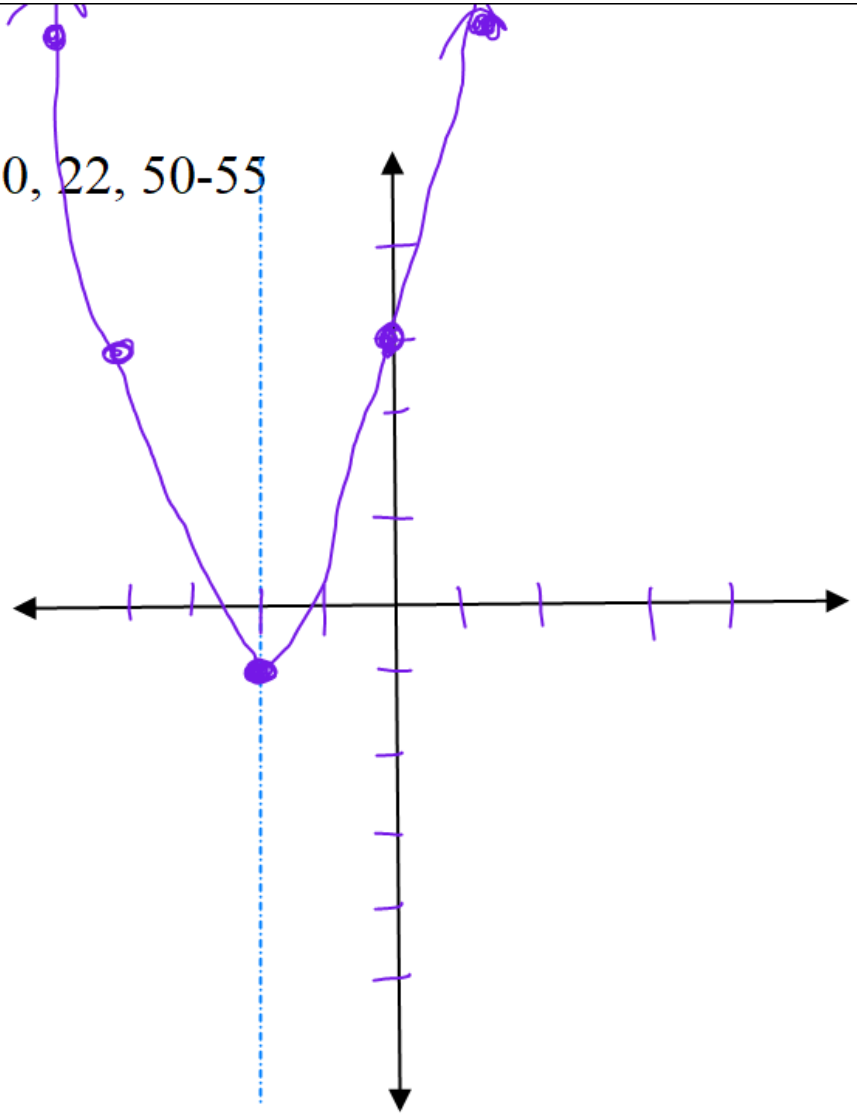
$-1 + 6 - 5$

$5 - 5$

0



Homework: pg. 560 #1-4, 11-14, 16, 20, 22, 50-55



(11) $f(x) = x^2 + 4x + 3$

(1) axis

$x = \frac{-b}{2a} = \frac{-4}{2} = -2$

(2) vertex

$(-2)^2 + 4(-2) + 3$ $(-2, -1)$

$4 + -8 + 3$

$-4 + 3 = -1$

(3) y-int

~~$x^2 + 4(0)$~~ $+3$ $(0, 3)$

(4) $x = 1$

$(1)^2 + 4(1) + 3$

$1 + 4 + 3 = 8$

(12) $y = 2x^2 - 6x$

(3) $x = 0$

$2(0)^2 - 6(0)$

$0 - 0$

0

(1) axis

$x = \frac{-b}{2a} = \frac{-(-6)}{2 \cdot 2} = \frac{6}{4} = 1\frac{1}{2}$

(2) Vertex

$y = 2(1\frac{1}{2})^2 - 6(1\frac{1}{2})$

$4.5 - 9$

-4.5

(4) $x = 1$

$2(1)^2 - 6(1)$

$2 - 6$

-4