

A function $f(x)$ is a *quadratic* if

$$f(x) = ax^2 + bx + c$$

a, b, c are #'s

Examples: $2x^2 + 7$ ✓

$$\begin{cases} a = 2 \\ b = 0 \\ c = 7 \end{cases}$$

→ $-3x^5 - 2x^2 + 1$ ✗

$5x^2 + 4x + 2$ ✓

$$\begin{cases} a = 5 \\ b = 4 \\ c = 2 \end{cases}$$

$2x + 3 - x^2$ ✓

$$\begin{cases} a = -1 \\ b = 2 \\ c = 3 \end{cases}$$

is this
a quadratic?

$$\begin{aligned} f(x) &= 3(x+5)(x-1) \\ &= (3x+15)(x-1) \\ &= 3x^2 - 3x + 15x - 15 \\ &= \boxed{3x^2 + 12x - 15} \end{aligned}$$

$$\begin{aligned} f(x) &= 3(x+5)(x-1) \\ &= 3[x^2 + 4x - 5] \\ &= 3x^2 + 12x - 15 \end{aligned}$$

$$f(x) = 3x^2 + 12x - 15$$

$$f(x) = ax^2 + bx + c$$

(a) is $f(x)$ going to be



or



if $a > 0 \Rightarrow$



$$1 + a < 0 \Rightarrow$$

(b) where is the vertex

$$\text{vertex} = (x\text{-coord}, y\text{-coord})$$

$$x\text{-coord} = -b/2a$$

$$y\text{-coord} = f\left(\frac{-b}{2a}\right)$$

$$f(x) = 3x^2 + 12x - 15$$

vertex

$$x: \frac{-12}{2(3)} = \frac{-12}{6} = -2$$

$$y \leadsto f(-2) = 3(-2)^2 + 12(-2) - 15$$

$$= 3 \cdot 4 - 24 - 15$$

$$= 12 - 24 - 15$$

$$= -12 - 15$$

$$= -27$$

{vertex: (-2, -27)}

(c) where are the y-int? $\leftarrow c = f(0)$

$$f(x) = 3x^2 + 12x - 15$$

set $x=0$

$$\hookrightarrow f(0) = 3(0) + 12(0) - 15$$

$$= -15$$

(0, -15)

where are the x-int?

↪ set $y = 0 \dots$
what x -values make

$$3x^2 + 12x - 15 = 0$$

from
before
FOIL

$$3(x+5)(x-1)$$

$$3 = 0 \leftarrow \text{never TRUE}$$

$$x+5 = 0 \Rightarrow \boxed{x = -5}$$

$$x-1 = 0 \Rightarrow \boxed{x = 1}$$

x-int:

$(-5, 0)$ and $(1, 0)$

$$f(x) = (x-5)(x+5)$$

① Are they ↺ ↻ ?

↺ ↻ ✓

vert
 $(0, -25)$ ✓

x-int: $(5, 0), (-5, 0)$

y-int: $(0, -25)$

② Find their vertices

$$g(x) = (2x+4)(x-6)$$

③

Find their x and y-int!!

vert

~~(1, 18)~~

(2, -32) ✓

x-int
(-2, 0), (6, 0)

y-int
(0, -24)

not done yet

thingy ma bobber

~~(-2, 18)~~

~~(-2, 0)~~

$$2x^2 - 12x + 4x - 24$$

$$2x^2 - 8x - 24$$

$$x = \frac{-b}{2a} \rightarrow \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$$

$$f(2) = 2(2)^2 - 8(2) - 24$$

$$\stackrel{!}{=} 8 - 16 - 24$$

$$\stackrel{!}{=} -8 - 24 = \textcircled{-32}$$

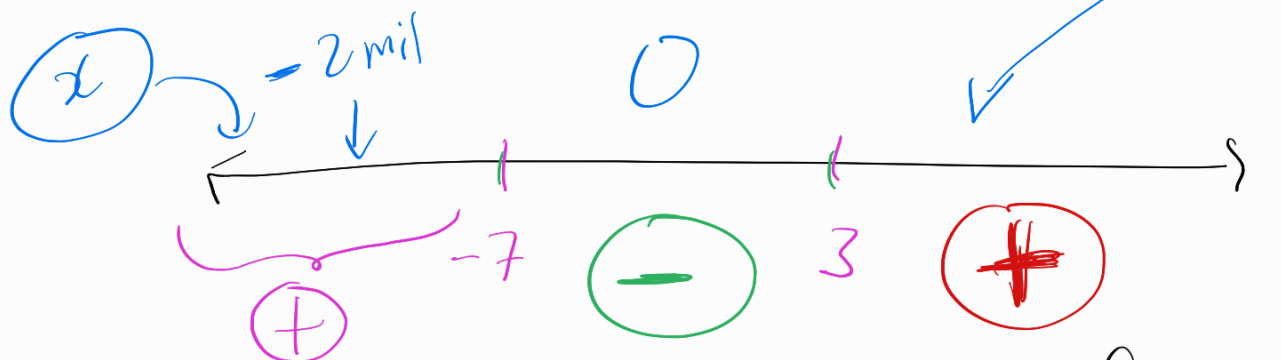
(2, -32)

$$\text{if } f(x) = (x-3)(x+7)$$

• where's x, y -int?

$$y\text{-int} = -21$$

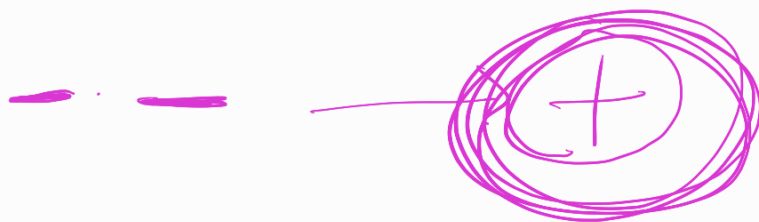
$$x = 3, -7$$



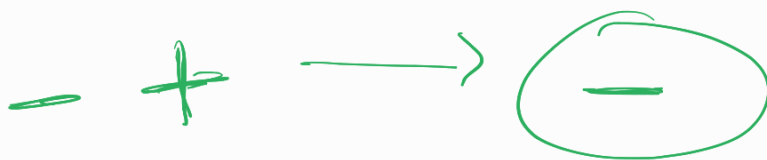
when is $f(x) > 0$? when is $f(x) < 0$

$$f(x) = (x-3)(x+7)$$

if $x = \text{super negative} \dots$



if $x = 0$



if $x = \text{super positive}$



$$f(x) = (2x - 6)(x + 4)$$

When is $f(x) > 0$ when is $f(x) < 0$?

(1) Find x -int $x = 3, -4$

(2)

