Types of functions - horizontal lines $y = 2$

- lines $y = mx + b$

if $m \neq 0$ this is all slanted lines!

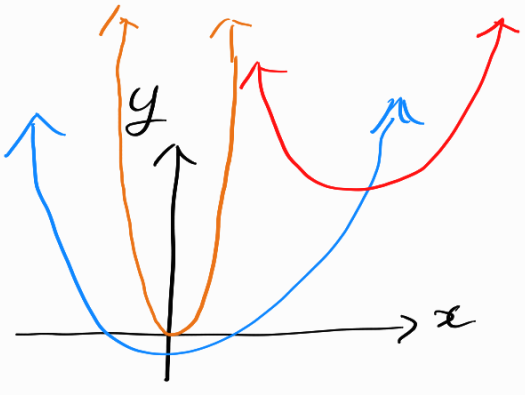
- absolute values too!

"Polynomials"

- quadratics ← right now!!
- everything else (cubics, quartics, quintics, ...)

Quadratics

Graphically:



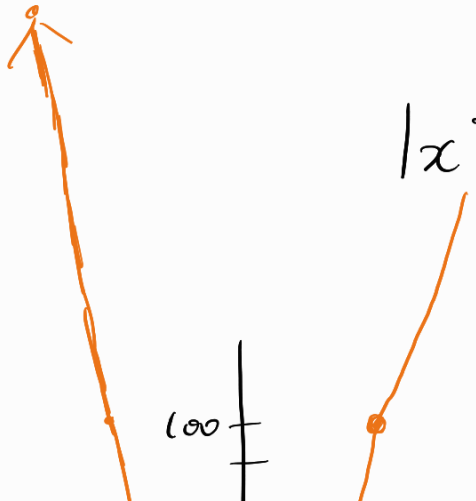
Algebraically: $y = f(x) = ax^2 + bx + c$ ("quadratic thingy")

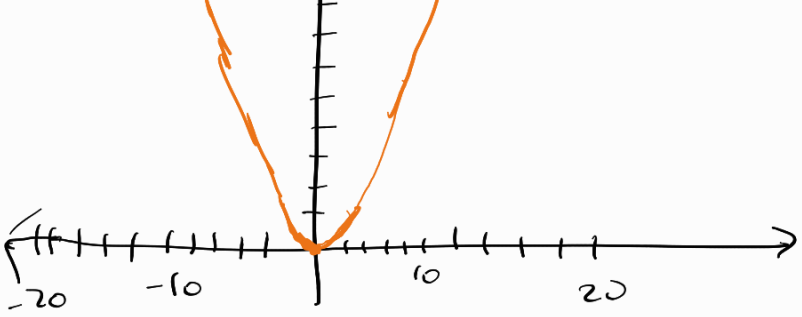
a, b, c are #'s

Example $f(x) = x^2$ ← $a = 1$, $b = 0$, $c = 0$

$1x^2 + 0x + 0$

x	$f(x)$
0	0
1	1
10	





20	400
-1	1
-10	100
-20	400

tells you if you're ∪ or ∩

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

$a > 0$: you ∪
$a < 0$: you ∩

Question: (Q1) when is it ∪ or ∩?

key idea: set $a = -1$

$-x^2 + 2x + c$

when is this > 0?
< 0?

if x is 1 million is x^2 bigger

So Q: which direction is x or $2x$ bigger?

$3x - 4 + 15x^2$ facing?

lets address after break

(Q2) where is the vertex?

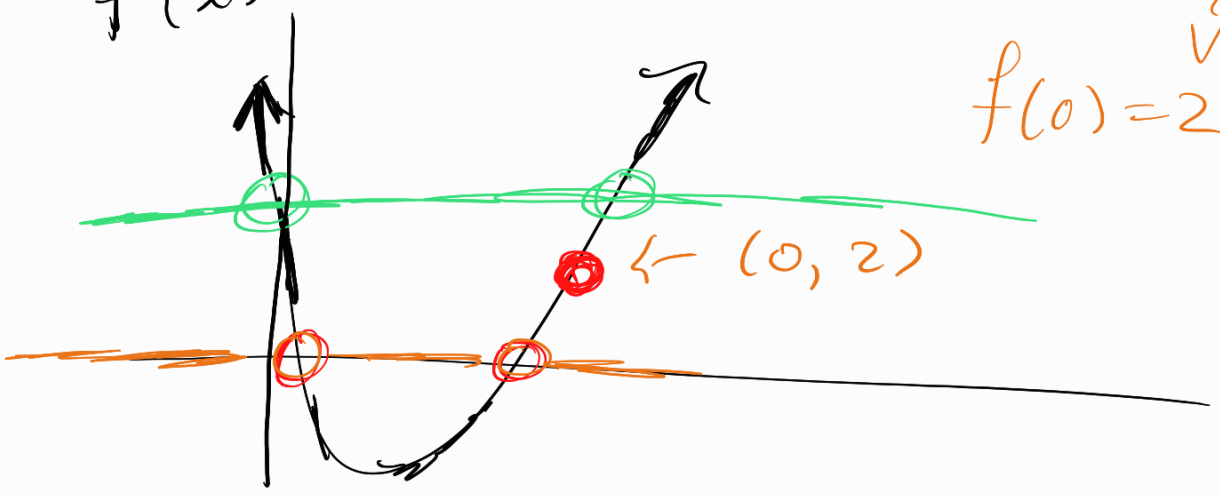
vertex

(Q3) where are the intercepts?

x & y

$f(x) = x^2 - 3x + 2$ ← "y-int"

$f(0) = 2$



when is $f(x) = 3$?

same!!

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

now it's solve for x!!

"factor"

FOIL

$(x-2)(x-1) = x^2 - 3x + 2$

new question

$(x-2)(x-1) = 0$

when $x = 2, 1$ ← x-int.

Questions: $f(x) = (2x+1)(x-3)$

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

what is a, b, c?

$2x^2 - 6x + 1x - 3 \rightsquigarrow 2x^2 - 5x - 3$

$a \quad b \quad c$

(b) what are the intercepts

x-int

$2x + 1 = 0 \rightsquigarrow x = -1/2$

$x - 3 = 0 \rightsquigarrow x = 3$

y-int

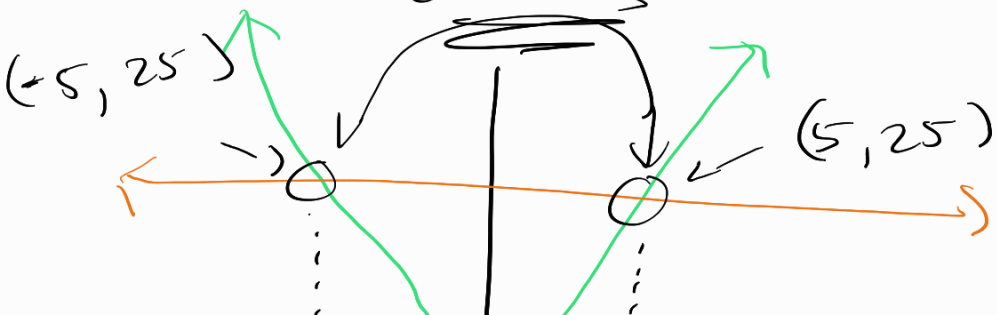
$y = -3$

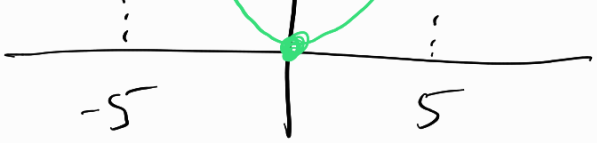
(c) facing $\cup$ or $\cap$?

(Q2) Where's vertex of $f(x) = ax^2 + bx + c$? ← will finally answer on Thurs...

Easier question: if $x^2 = 25$

2 answers: what's $x = 5, -5$?





- if $(x-3)^2 = 25$

$\hookrightarrow$ $x-3=5$ $\quad$ $x-3=-5$

$x=8$ $\quad$ $x=-2$

- if $(2x-3)^2 = 25$

what's x = ?

$2x-3=5$ $\quad$ $2x-3=-5$

$2x=8$ $\quad$ $2x=-2$

$\boxed{x=4}$ $\quad$ $\boxed{x=-1}$

Factoring

reverse FOILing

$\longleftrightarrow$

- $(x+a)(x+b) = x^2+bx+ax+ab$

$\overset{!}{=} x^2+(a+b)x+ab$

Factor $x^2 + 10x + 21$

$a + b = 10$
$ab = 21$

$a = 3, b = 7$

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

Factor the following

- $x^2 - 16 = (x+4)(x-4)$
- $x^2 - 31x + 30 = (x-30)(x-1)$
- $x^2 + 13x + 40 = (x+8)(x+5)$
- $x^2 + x - 2 = (x+2)(x-1)$
- $x^2 - 50x + 625 = (x-25)^2$