

• So far we've only working w/ lines

• Polynomials... quadratics are special case

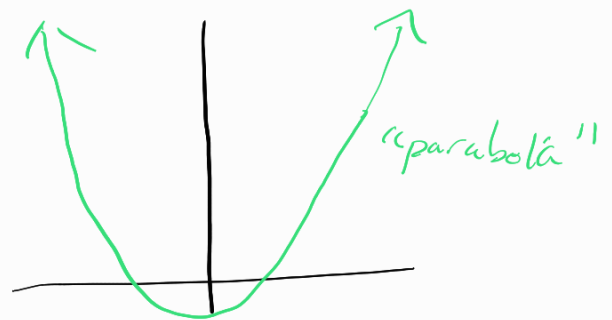
Algebraic

$ax^2 + bx + c$ ← quadratic object
(a, b, c are #'s)

$a \neq 0$

if $a = 0$, quadratic becomes a line object

Geometric





Question is $(x-3) \cdot (2x+1)$ quadratic? ✓

always TRUE

$$\begin{aligned} & 2x^2 + 1x - 6x - 3 \\ & \underline{2x^2 - 5x - 3} \end{aligned}$$

$$\begin{aligned} a &= 2 \\ b &= -5 \\ c &= -3 \end{aligned}$$

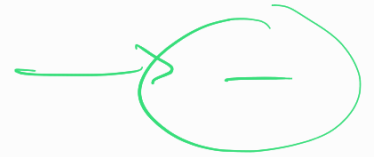
Food for thought: • how can we tell if quadratic object is  or ?

if $x \rightarrow$ 1 billion

$3x^2 - 2x + 1$



$$\underline{-7x^2 + 1000x + 2023}$$



• where is the vertex

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

memorise
for now

magic

x-coord
vertex is $-\frac{b}{2a}$

vertex is at

$$\left(\underbrace{-\frac{b}{2a}}_x, \underbrace{f\left(-\frac{b}{2a}\right)}_y \right)$$

$$f(x) = 2x^2 - 8x + 15$$

Find vertex

$$a = 2$$

$$b = -8$$

$$c = 15$$

x-coord: $\frac{-(-8)}{2(2)} = 2$

$$(2, 7)$$

$$f(2) = 2(2)^2 - 8(2) + 15$$

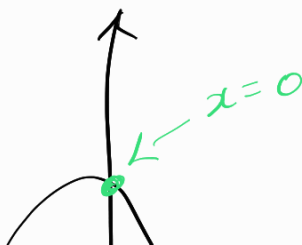
$$= 8 - 16 + 15$$

$$= 7$$

• where are the intercepts

x & y

To get y-int set $x=0$



$$f(x) = -2x^2 - 15x + 7$$



To get x-int ← much harder
(but it's solve for x!)

y-int

Solve for x:

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

$$x = 0, 1$$

$$\underline{(x-1)} \underline{(x+2)} \underline{(x-3)} = 0$$

$$x = 1, -2, 3$$

Find x-int of

$$f(x) = (2x-3)(x+5)$$

$$x = -5, 3/2$$

$$2x-3 = 0 \leadsto 2x=3 \leadsto x=3/2$$

$$x+5 = 0 \leadsto x = -5$$

Try on own:

$$2x^2 - 5x - 3$$

$$a = 2$$

$$b = -5$$

$$c = -3$$

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

Q1 is it \uparrow or \downarrow $2x+1=0 \leadsto x=-\frac{1}{2}$

Q2 where's vertex $\mid x = \frac{-b}{2a} = \frac{5}{4}$

$$f\left(\frac{5}{4}\right) = 2\left(\frac{5}{4}\right)^2 - \frac{5}{1}\left(\frac{5}{4}\right) - 3$$

$$= 2\left(\frac{25}{16}\right) - \frac{25}{4} - 3$$

$$= \frac{50}{16} - \frac{25}{4} - 3$$

common denom needed

$$\rightarrow \frac{50}{16} - \frac{100}{16} - 3$$

$$= \frac{-50}{16} - \frac{48}{16} = \frac{-98}{16} = \frac{-49}{8}$$

vertex: $\left(\frac{5}{4}, -\frac{49}{8}\right)$

Q3 where's x-int $\leftarrow 2$ ans

y-int $\leftarrow 1$ ans

$$\rightarrow x=3, x=-1/2$$

x-int $(3, 0)$ and $(-1/2, 0)$

y-int: $(0, -3)$

