

Graphs of quadratics

$$f(x) = ax^2 + bx + c \quad (\text{Parabolas})$$

$(a \neq 0)$

Ex 1 $f(x) = 2x^2 - 7x + 5$

y-int: when $x=0$

$$f(0) = 2(0)^2 - 7(0) + 5$$

$$\underline{f(0) = 5}$$

x-int: when $y=0$

$$f(x) = 0 = 2x^2 - 7x + 5 \quad \text{factor}$$

$$0 = (x-1)(2x-5)$$

↑
If 0,
then the
whole thing
is zero

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

$$2x-5=0 \Rightarrow 2x=5$$

$$\boxed{x = \frac{5}{2} = 2.5}$$

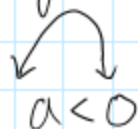
Aside: If our quadratic is a perfect square

$$\text{ex } f(x) = (x-4)^2; \text{ } x\text{-int } x=4 \text{ only}$$

If we can't factor our quadratic

$$\text{ex } f(x) = x^2 + 2x + 6; \text{ No } x\text{-int}$$

Vertex: Lowest or highest point



Notice: if we draw a vertical line through the vertex, the parabola is symmetric (mirror image). So, the vertex must be in the middle of the two x -intercepts (x_1 and x_2)

$$\text{To find middle: } \frac{x_1 + x_2}{2}$$

$$\text{In our example: } \frac{1 + 2.5}{2} = \frac{3.5}{2} = 1.75$$

x-value
at vertex = 1.75

vertical line

and we say: $x = 1.75$

is called the
axis of Symmetry

Domain/Range:

Domain: allowed x-values

Range: allowed y-values

All x-values are allowed for
parabolas

Domain: $x \in \mathbb{R}$ (Any real number)

All y-values are allowed that
are equal to the vertex or
greater than the vertex ($a > 0$) /

Smaller than the vertex ($a < 0$)

y-value at vertex: $f(1.75) = 2(1.75)^2 - 7(1.75) + 5$
 $= -1.125$

Range: $y \geq -1.125$