Quadratics (degree 2)

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

$(a \neq 0)$

Parabolas

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

y-int: when $x = 0$

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

$f(0) = 5$ $\quad y = 5$

x-int: when $y = 0$

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

$0 = (2x - 5)(x - 1)$ ← Factor

If this is 0, then $f(x)$ is 0

f(x) is 0

① $2x-5=0 \Rightarrow 2x=5$

$x_1 = \frac{5}{2} = 2.5$

② $x-1=0 \Rightarrow x_2 = 1$

Aside: if f(x) is a perfect square

ex $f(x) = (x-4)^2$; x-int $x_1 = 4$

only 1 x-int

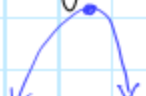
if f(x) can't be factored

ex $f(x) = x^2 + 2x + 6$

NO x-ints

Vertex: Lowest or highest point

(a > 0)



(a < 0)

If we draw a vertical line through the vertex, the parabola is symmetric (mirror image), so we can use the middle of the x-intercepts to find the vertex

$$\text{x-value for vertex} = \frac{x_1 + x_2}{2} = \frac{1 + 2.5}{2}$$

$$\boxed{x = 1.75}$$

y-value for vertex:

$$f(1.75) = 2(1.75)^2 - 7(1.75) + 5$$

$$\boxed{y = -1.125}$$

Vertex: $(1.75, -1.125)$

Axis of Symmetry: vertical line in the middle of parabola

$x = 1.75$

Domain/Range:

Domain: allowed x-values

Range: allowed y-values

Domain: No x-values are a problem for all parabolas

$x \in \mathbb{R}$

Range: $a > 0$ (upwards)

$y \geq$ y-value of vertex

$a < 0$ (downwards)

$y \leq$ y-value of vertex

Range: $y \geq -1.125$ (upwards)