For the rest of the unit, we will be graphing quadratics (degree 2) of the form:

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

$$(a \neq 0)$$

also called parabolas!

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

y-int: where $x = 0$

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

$f(0) = 5$ y-int: 5

x-int: where $y = 0$

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

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

If this is 0, the whole thing is zero

① $2x - 5 = 0 \Rightarrow x_1 = \frac{5}{2} = 2.5$ ← x-int #1

② $x - 1 = 0 \Rightarrow x_2 = 1$ ← x-int #2

Aside: If $f(x)$ is a perfect square

ex $f(x) = (x-4)^2$

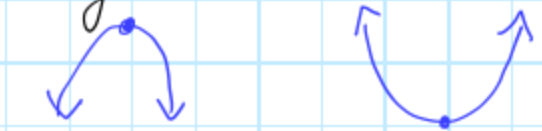
x-int: $x_1 = 4$ only 1 x-int

If $f(x)$ can't be factored

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

there are NO x-int

Vertex: highest or lowest point



$(a<0)$ $(a>0)$

If we draw a vertical line in the middle of the parabola, the parabola is symmetric (mirror image)

this line and vertex is half-way between the two x-intercepts.

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

$$= 1.75$$

y-value of vertex: $f(1.75)$

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

$= -1.125$

Vertex: $(1.75, -1.125)$

Axis of Symmetry: line splitting the parabola

$x = 1.75$

Domain/Range:

Domain: allowed x-values

Range: allowed y-values

Domain: no restrictions on x

$$x \in \mathbb{R}$$

Range: Bigger (a>0) or smaller (a<0) than y-value at vertex

$$y \geq -1.125$$