Quadratic Inequalities

Be good at recognizing a quadratic equation. They are all polynomials of degree 2 (two is the highest power). There are 4 inequality symbols.

$ax^2 + bx + c < 0$ or $ax^2 + bx + c \leq 0$ or $ax^2 + bx + c > 0$ or $ax^2 + bx + c \geq 0$

We have a number of strategies to solve these.

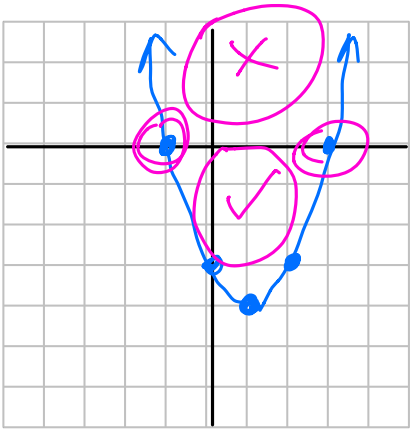
#1- We solve graphically - just like with the linear versions
With one extra step.

Eg: $x^2 - 2x - 3 \leq 0$

$y = (x-1)^2 - 1 - 3 \leq 0$

$y = (x-1)^2 - 4 \leq 0$

$y \leq (x-1)^2 - 4$



D: $\{x \mid -1 \leq x \leq 3, x \in \mathbb{R}\}$

Once we have it graphed, we need to know which portion of the parabola is a solution to our inequality.

Our inequality is asking for all of the points that cause $x^2 - 2x - 3$ to be ≤ 0.

We can use test points (3 in this case to confirm our intuition) and we must also decide if we are to use $(\circ,$ or $\bullet)$.

Answer is a solution set:

$\{x | -1 \leq x \leq 3, x \ \epsilon \ \mathbb{R}\}$

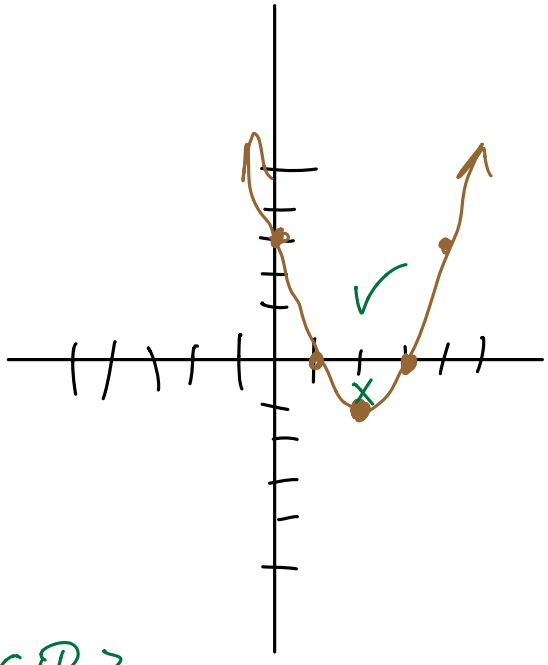
Eg2:

$$x^2 - 4x > -3$$

$x^2 - 4x + 3 > 0$

$(x-2)^2 - 4 + 3 > 0$

$(x-2)^2 - 1 > 0$

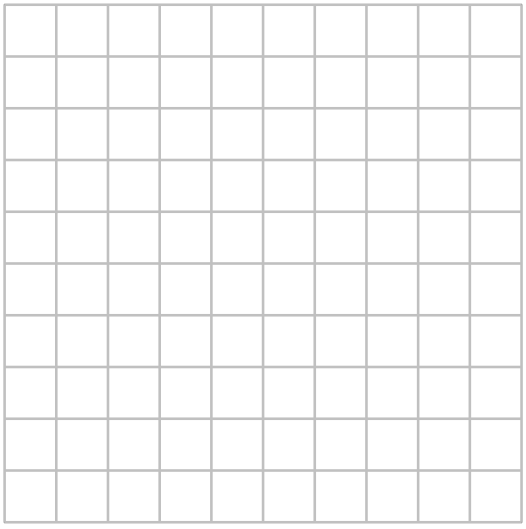


set notation

$\{x | -\infty < x < 1, \ 3 < x < \infty, \ x \in \mathbb{R}\}$

Interval notation

$(-\infty, 1) \cup (3, \infty)$

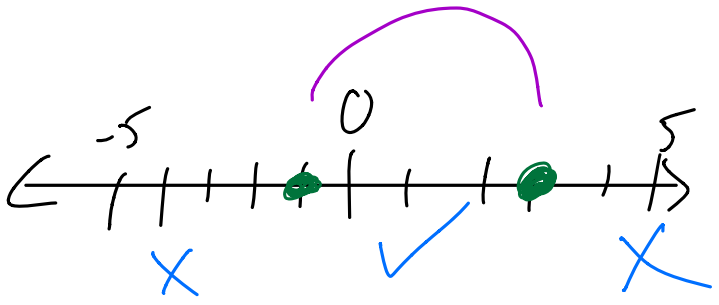
Complete the square	
Graph	
Which part of the parabola is a solution?	
$(\circ,$ or $\bullet)$	
Solution Set	$\{x\|$ $,x \in \mathbb{R}\}$

Method 2: Solve Algebraically

- ➔ Factor
  - ◆ In order to find the roots (zeroes)
- ➔ Put the points on a number line
- ➔ Test your intervals
- ➔ Write the solution set

Eg: $x^2 - 2x - 3 \leq 0$

$(x-3)(x+1) \leq 0$



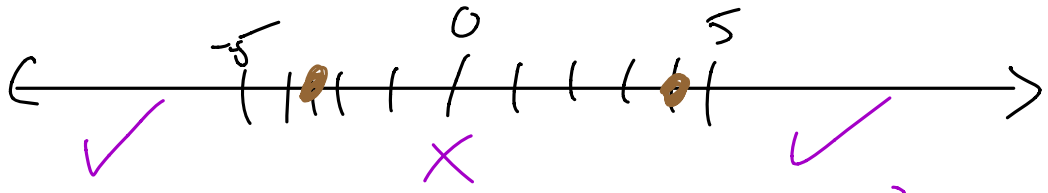
$\{x \mid -1 \leq x \leq 3, x \in \mathbb{R}\}$

$[-1, 3]$

Eg: $-x^2 + x + 12 < 0$

$x^2 - x - 12 > 0$

$(x-4)(x+3) > 0$



✓ X ✓

$\{x \mid -\infty < x < -3,\ 4 < x < \infty,\ x \in \mathbb{R}\}$

$(-\infty, -3) \cup (4, \infty)$

Eg: $2x^2 - 3x > 2$

Hint: $\{x \mid x < -\frac{1}{2},\ 2 < x,\ x \in \mathbb{R}\}$

$2x^2 - 3x - 2 > 0$

$m \Rightarrow -4$ $-4, 1$

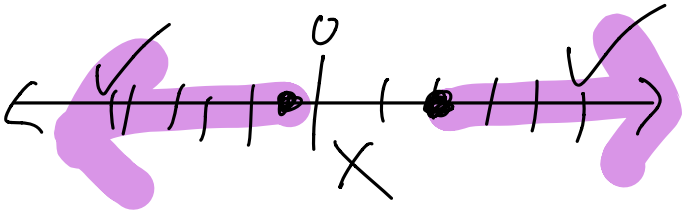
$a \Rightarrow -3$

$2x^2 - 4x + x - 2$

$2x(x-2) + (x-2)$

$(x-2)(2x+1) > 0$

$x = 2$ or $x = -\frac{1}{2}$



$(-\infty, -\frac{1}{2}) \cup (2, \infty)$