# Sec 3.6.1
Polynomial Inequalities

We will be finding where polynomials are greater than or less than zero. In order to know where they're "above" or " below" zero, we need to find where they cross, or, the x-intercepts.
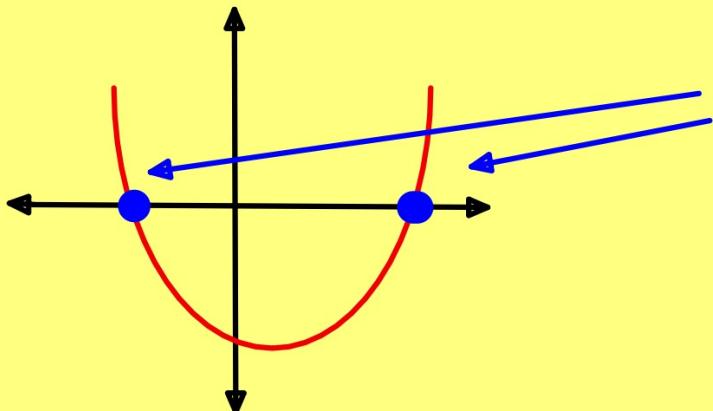
If we know where the parabola crosses the x-axis, we can determine on which intervals the polynomial is greater than, or less than, zero.

Steps-
1. Get a zero on one side of the inequality
2. Determine where it equals zero ⟵ critical #'s
3. Test an x value in each interval to determine
if greater than, or less than, zero

Solve (answer all in interval notation)

$(x+3)(x-5) \geq 0$

⟵ neg

$(x+1)(x-7)$ ⟨≤ 0⟩

CNs → 7, -1

− − | + − | + +

-1   7

test
#'s →   - 2   0   8

⊕   ⊖   ⊕ ⟵ look for answer

If the inequality had been > 0?

$[-1, 7] \leq 0$

> 0? $(-\infty, -1) \cup (7, \infty)$
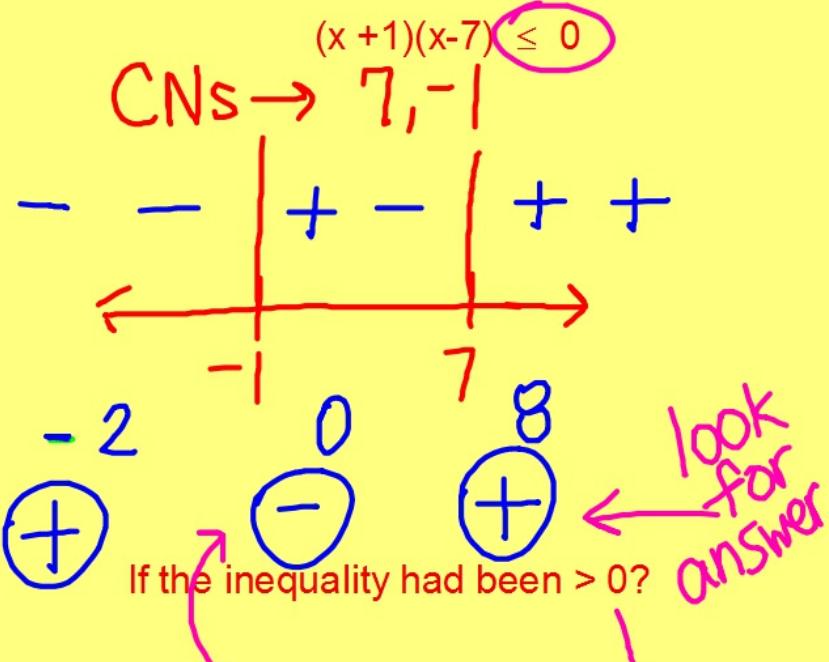
$x^2 - 4x + 3 \geq 0$ → ooo   where is this graph on, or above, the x-axis?

$(x-3)(x-1) \geq 0$

− − | − + | + +   ← positive or zero

0   2   3   4 ← test

⊕   ⊖   ⊕

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

1. Get a zero
2. Factor
3. Determine x-intercepts
4. Test on all sides of all x-intercepts.
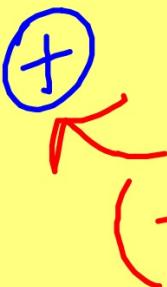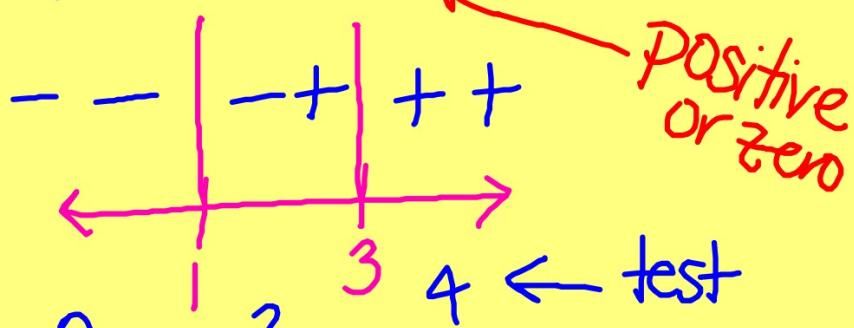
$9x^2 - 6x + 1 < 0$ ← neg

$x^2 - 6x + 9$

$(x - \frac{3}{9})(x - \frac{3}{9})$

$(x - \frac{1}{3})(x - \frac{1}{3})$

$(3x - 1)(3x - 1) < 0$

≤ 0

$[\frac{1}{3}]$

$- - - \mid + +$
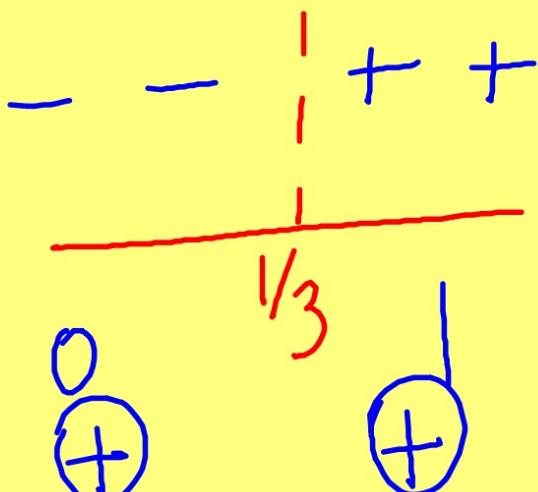
What if the inequality had been > 0 ?

$(-\infty, \frac{1}{3}) \cup (\frac{1}{3}, \infty)$

$\geq 0 \quad \mathbb{R}$

no solution

$\frac{1}{3}$

0 ⊕

⊕

$3x^2 - 5x \leq 0$

$$x(3x - 5)$$

$x^2 \leq 2x + 2$

$x^2 - 2x - 2 \leq 0$ ← neg

$+ \; | \; - \; | \; +$

$1 - \sqrt{3} \quad 1 + \sqrt{3} \quad ③$

need zeros...

$$x = \frac{2 \pm \sqrt{4 - 4(-2)}}{2}$$

$$= \frac{2 \pm \sqrt{12}}{2}$$

$$= \frac{2 \pm 2\sqrt{3}}{2} = 1 \pm \sqrt{3}$$

(-1) $⓪$ $③$
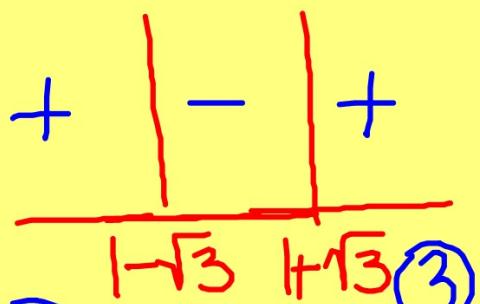
my test #'s plugged into $x^2 - 2x - 2$

since we don't have factors

Answer → $[1 - \sqrt{3}, 1 + \sqrt{3}]$

Suggested Practice
Sec 3.6
page 420

1,3,5,9,21,25

Solutions—

1. $(-\infty, -2) \cup (4, \infty)$ 9. $\varnothing$

3. $[-3, 7]$ 21. $\left(-\infty, -\frac{3}{2}\right) \cup (0, \infty)$

5. $(-\infty, 1) \cup (4, \infty)$ 25. $\left[2 - \sqrt{2}, \ 2 + \sqrt{2}\right]$