

Unit 8: Systems of Equations; Linear & Quadratic Inequalities**8.3 Quadratic Inequalities in One Variable**ex. Solve $x^2 - 2x - 3 \leq 0$

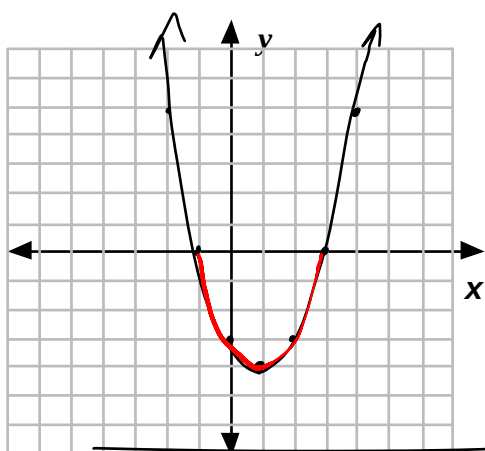
Method 1: Graphing

$$y = x^2 - 2x - 3$$

$$y = (x^2 - 2x + 1) - 3 - 1$$

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

when is the graph
on or below
the x-axis



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

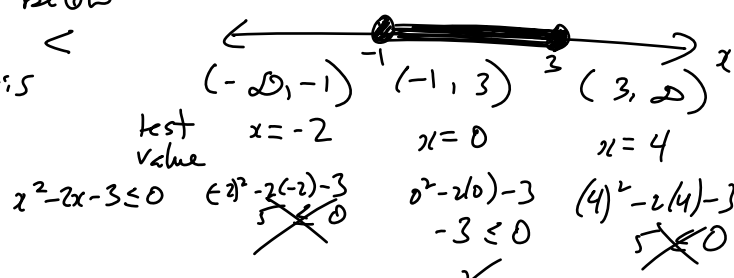
Method 2: Roots & Test Points (Intervals)

find roots (zeros) of

$$x^2 - 2x - 3 = 0$$

$$(x-3)(x+1) = 0$$

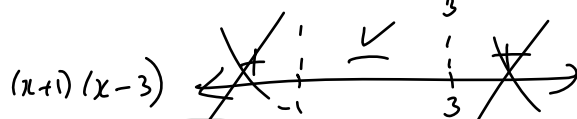
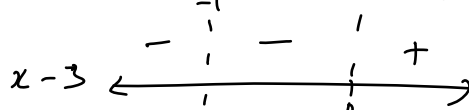
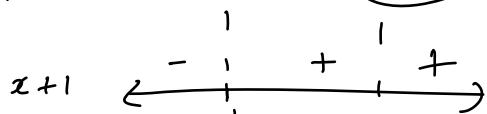
$$x = 3 \quad x = -1$$



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

Method 3: Sign Analysis

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

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

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

ex. Solve $-x^2 + x + 12 < 0$ by roots & test points. Verify using sign analysis.

$$\begin{aligned}
 x^2 - x - 12 &> 0 \\
 (x-4)(x+3) &> 0
 \end{aligned}$$

$x+3$

$x-4$

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

$\{x \mid x < -3 \text{ or } x > 4, x \in \mathbb{R}\}$

ex. Solve $2x^2 - 7x > 12$

$$2x^2 - 7x - 12 > 0$$

roots? $x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-12)}}{2(2)}$

$$= \frac{7 \pm \sqrt{49 + 96}}{4} \approx 4.76 \text{ or } -1.26$$



test	$x = -2$	$x = 0$	$x = 5$
$2x^2 - 7x > 12$	$2(-2)^2 - 7(-2)$	$2(0)^2 - 7(0)$	$2(5)^2 - 7(5)$
	$22 > 12$	$0 > 12$	$15 > 12$
	✓	✗	✓

$$\therefore \left\{ x \mid x < \frac{7 - \sqrt{145}}{4} \text{ or } x > \frac{7 + \sqrt{145}}{4}, x \in \mathbb{R} \right\}$$

Practice: pg. 484/ # 1 - 3, 4bd, 5bc, 7a(graph paper)bc(calculator), 9, 15abef,