Lesson 3 Quadratic Inequalities in One Variable

Recall:

Inequalities:

$<$	means	less than
$\leq$	means	less than or equal to
$>$	means	greater than
$\geq$	means	greater than or equal to

When the equals sign in a quadratic equation is replaced with an inequality sign, ***a quadratic inequality in one variable*** is formed.

Quadratic Inequalities in One Variable

A quadratic inequality in one variable can be written in general form as:

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

Where a, b, and c are constants and $a \neq 0$.

The x-intercepts of the graph of a quadratic function are called the ***critical values*** of the corresponding quadratic inequality.

-1 and 3

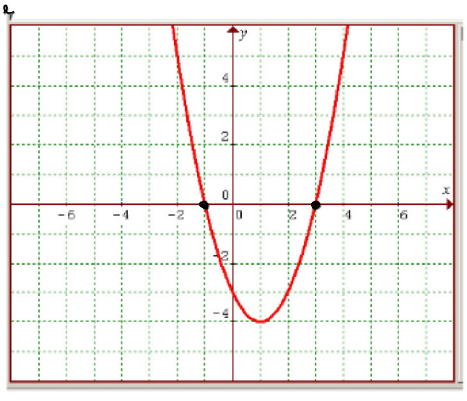
Example 1

Using the given graph, solve $x^2 - 2x - 3 > 0$ (positive)

$\hookrightarrow x^2 - 2x - 3 > y$

↑ replace y with 0

sol'n of $x^2 - 2x - 3 > 0$ are all +ve y-values



sol'n

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

↑ union (or)

Note: $x^2 - 2x - 3 < 0$

sol'n $(-1, 3)$

Now solve, algebraically

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

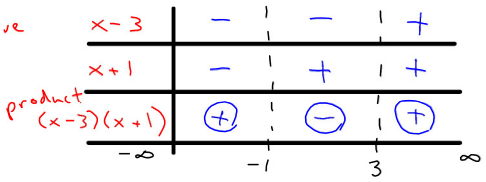
positive

corresponding eqn

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

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

$x = 3 \quad x = -1$



test values −3 0 7/4

sol'n $(-\infty, -1) \cup (3, \infty)$

Example 2

Solve: $(2x + 1)(x - 5) \leq 0$

$2x+1=0$

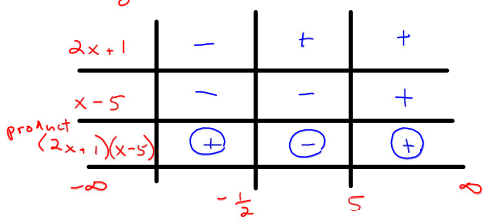
$2x = -1$

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

negative

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

$x = -\frac{1}{2} \quad x = 5$



sol'n $\left[-\frac{1}{2}, 5\right]$

$-2x^2 + 5x + 12 \leq 0$

$0 \leq 2x^2 - 5x - 12$

Example 3

Solve: $5x \geq 2(x^2 - 6)$

$5x \geq 2x^2 - 12$

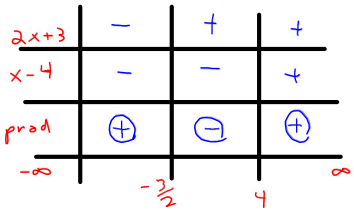
$0 \geq 2x^2 - 5x - 12$

$0 \geq (2x+3)(x-4)$

$x = -\frac{3}{2} \quad x = 4$

or $(2x+3)(x-4) \leq 0$

* bring to side where x^2 terms is positive or will have to flip the inequality when divide by a negative



sol'n $\left[-\frac{3}{2}, 4\right]$

pg. 330 and worksheet

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1-3, 5-8

challenge 4, 9