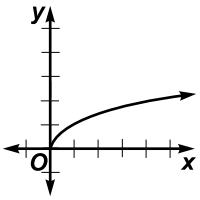
NAME _____ DATE _____ PERIOD _____

Study Guide

Graphs of Nonlinear Inequalities

Graphing an inequality in two variables identifies all ordered pairs that satisfy the inequality. The first step in graphing nonlinear inequalities is graphing the boundary.

Example 1 **Graph $y < \sqrt{x - 3} + 2$.**

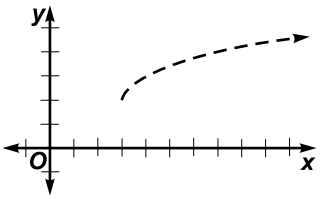


The boundary of the inequality is the graph of $y = \sqrt{x - 3} + 2$. To graph the boundary curve, start with the parent graph $y = \sqrt{x}$. Analyze the boundary equation to determine how the boundary relates to the parent graph.

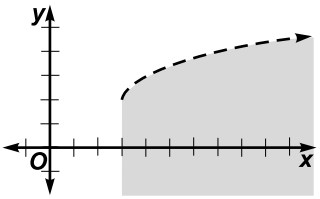
$$y = \sqrt{x - 3} + 2$$

move 3 units right *move 2 units up*

Since the boundary is not included in the inequality, the graph is drawn as a dashed curve.



The inequality states that the y-values of the solution are less than the y-values on the graph of $y = \sqrt{x - 3} + 2$. Therefore, for a particular value of x, all of the points in the plane that lie below the curve have y-values less than $\sqrt{x - 3} + 2$. This portion of the graph should be shaded.



To verify numerically, test a point not on the boundary.

$y < \sqrt{x - 3} + 2$

$0 \overset{?}{<} \sqrt{4 - 3} + 2$ *Replace (x, y) with (4, 0).*

$0 < 3$ ✓ *True*

Since (4, 0) satisfies the inequality, the correct region is shaded.

Example 2 **Solve $|x - 3| - 2 > 7$.**

Two cases must be solved. In one case, $x - 3$ is negative, and in the other, $x - 3$ is positive.

Case 1 If $a < 0$, then $|a| = -a$.

$-(x - 3) - 2 > 7$

$-x + 3 - 2 > 7$

$-x > 6$

$x < -6$

Case 2 If $a > 0$, then $|a| = a$.

$x - 3 - 2 > 7$

$x - 5 > 7$

$x > 12$

The solution set is $\{x \mid x < -6 \text{ or } x > 12\}$.