Solving Inequalities

To solve an inequality, expressed by the form of $f(x) \leq 0$, $f(x) \geq 0$, or form of $f(x) \leq g(x)$, $f(x) \geq g(x)$, means to find all values that make the inequality true.

There are two methods of finding these values for one-variable inequalities, using graphical techniques. The first method involves rewriting the inequality so that the right-hand side of the inequality is 0 and the left-hand side is a function of x. For example, to find the solution to $f(x) < 0$, determine where the graph of $f(x)$ is below the x-axis. The second method involves graphing each side of the inequality as an individual function. For example, to find the solution to $f(x) < g(x)$, determine where the graph of $f(x)$ is below the graph of $g(x)$.

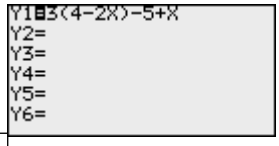
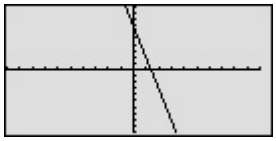
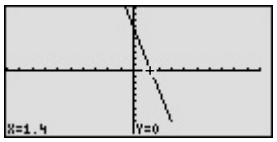
Example

Solve an inequality in two methods.

1. Solve $3(4 - 2x) \geq 5 - x$, by rewriting the right-hand side of the inequality as 0.

2. Solve $3(4 - 2x) \geq 5 - x$, by shading the solution region that makes the inequality true.

Before Starting There may be differences in the results of calculations and graph plotting depending on the setting. Return all settings to the default value and delete all data.

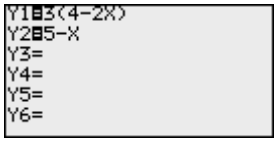
Step & Key Operation	Display	Notes
1-1 Rewrite the equation $3(4 - 2x) \geq 5 - x$ so that the right-hand side becomes 0, and enter $y = 3(4 - 2x) - 5 + x$ for Y1. [Y=] [3] [(] [4] [−] [2] [X/θ/T/n] [)] [−] [5] [+] [X/θ/T/n]		$3(4 - 2x) \geq 5 - x$ → $3(4 - 2x) - 5 + x \geq 0$
1-2 View the graph. [GRAPH]		
1-3 Find the location of the x-intercept and solve the inequality. [2nd F] [CALC] [5]	 	The x-intercept is located at the point (1.4, 0). Since the graph is above the x-axis to the left of the x-intercept, the solution to the inequality $3(4 - 2x) - 5 + x \geq 0$ is all values of x such that $x \leq 1.4$.

Step & Key Operation	Display	Notes

2-1 Enter $y = 3(4 - 2x)$ for Y1 and $y = 5 - x$ for Y2.

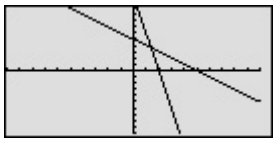
[Y=] [▶] (7 times) [DEL] (4 times)

[ENTER] [5] [—] [X/θ/T/n]



2-2 View the graph.

[GRAPH]



2-3 Access the Set Shade screen.

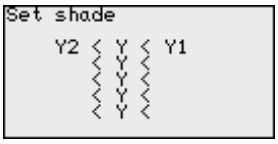
[2nd F] [DRAW] [G]

[1]

2-4 Set up the shading.

[2nd F] [VARS] [A] [ENTER] [A] [2] [▶]

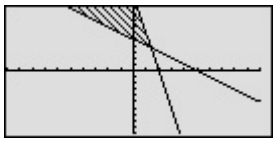
[2nd F] [VARS] [ENTER] [1]



Since the inequality being solved is $Y1 \geq Y2$, the solution is where the graph of Y1 is "on the top" and Y2 is "on the bottom."

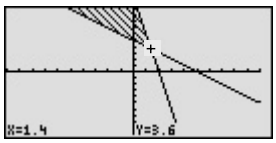
2-5 View the shaded region.

[GRAPH]



2-6 Find where the graphs intersect and solve the inequality.

[2nd F] [CALC] [2]



The point of intersection is (1.4, 3.6). Since the shaded region is to the left of $x = 1.4$, the solution to the inequality $3(4 - 2x) \geq 5 - x$ is all values of x such that $x \leq 1.4$.

Graphical solution methods not only offer instructive visualization of the solution process, but they can be applied to inequalities that are often difficult to solve algebraically. The EL-9900 allows the solution region to be indicated visually using the Shade feature. Also, the points of intersection can be obtained easily.