Solving Double Inequalities

The solution to a system of two inequalities in one variable consists of all values of the variable that make each inequality in the system true. A system $f(x) \geq a$, $f(x) \leq b$, where the same expression appears on both inequalities, is commonly referred to as a "double" inequality and is often written in the form $a \leq f(x) \leq b$. Be certain that both inequality signs are pointing in the same direction and that the double inequality is only used to indicate an expression in x "trapped" in between two values. Also a must be less than or equal to b in the inequality $a \leq f(x) \leq b$ *or* $b \geq f(x) \geq a$.

Example

Solve a double inequality, using graphical techniques.

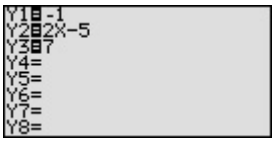
$2x - 5 \geq -1$
$2x - 5 \leq 7$

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
(When using EL-9650/9600c) *Use either pen touch or cursor to operate.	(When using EL-9650/9600c)	

1 Enter $y = -1$ for Y1, $y = 2x - 5$ for Y2, and $y = 7$ for Y3.

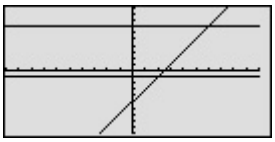
[Y=] [(-)] [1] [ENTER]*
[2] [X/θ/T/n] [—] [5] [ENTER]* [7]



The "double" inequality given can also be written to $-1 \leq 2x - 5 \leq 7$.

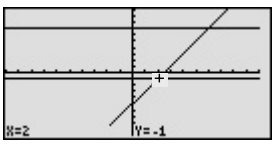
2 View the lines.

[GRAPH]

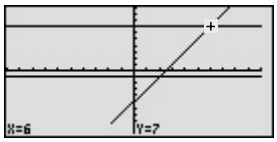


3 Find the point of intersection.

[2nd F] [CALC] [2]*



$y = 2x - 5$ and $y = -1$ intersect at (2, -1).

Step & Key Operation (When using EL-9650/9600c) *Use either pen touch or cursor to operate.	***Display*** (When using EL-9650/9600c)	***Notes***
4 Move the tracer and find another intersection. [▲] [2nd F] [CALC] [2]*		$y = 2x - 5$ and $y = 7$ intersect at (6,7).
5 Solve the inequalities.		The solution to the "double" inequality $-1 \leq 2x - 5 \leq 7$ consists of all values of x in between, and including, 2 and 6 (i.e., $x \geq 2$ and $x \leq 6$). The solution is $2 \leq x \leq 6$.

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-9650/9600c/9450/9400 allows the solution region to be indicated visually using the Shade feature. Also, the points of intersection can be obtained easily.