Solving Absolute Value Equations

The absolute value of a real number x is defined by the following:

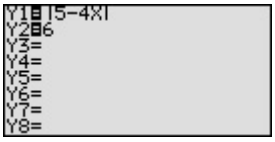
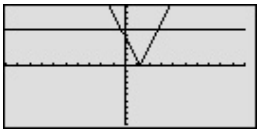
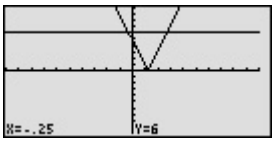
$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x \leq 0 \end{cases}$$

If n is a positive number, there are two solutions to the equation $|f(x)| = n$ because there are exactly two numbers with the absolute value equal to n: n and $-n$. The existence of two distinct solutions is clear when the equation is solved graphically.

Example

Solve an absolute value equation $|5 - 4x| = 6$

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 (When using EL-9650/9600c) *Use either pen touch or cursor to operate.	Display (When using EL-9650/9600c)	Notes
1 Enter $y = |5 - 4x|$ for Y1. Enter $y = 6$ for Y2. Y= MATH B* 1* 5 — 4 X/θ/T/n ENTER* 6		
2 View the graph. GRAPH		There are two points of intersection of the absolute value graph and the horizontal line $y = 6$.
3 Find the points of intersection of the two graphs and solve. 2nd F CALC 2* 2nd F CALC 2*		The solution to the equation $|5 - 4x| = 6$ consists of the two values -0.25 and 2.75. Note that although it is not as intuitively obvious, the solution could also be obtained by finding the x-intercepts of the function $y = |5x - 4| - 6$.

The EL-9650/9600c/9450/9400 shows absolute values with | |, just as written on paper, by using the Equation editor. The graphing feature of the calculator shows the solution of the absolute value function visually.