

Solving Absolute Value Equations

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

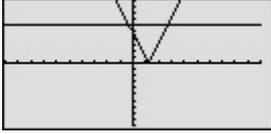
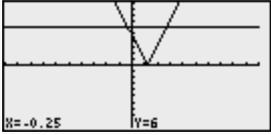
$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x \leq 0 \end{cases}$$

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.

<u>Step & Key Operation</u>	<u>Display</u>	<u>Notes</u>
<p>1 Enter $y = 5 - 4x$ for Y1. Enter $y = 6$ for Y2.</p> <p>Y= MATH B 1 5 - 4</p> <p>X/θ/T/II ENTER 6</p>		
<p>2 View the graph.</p> <p>GRAPH</p>		There are two points of intersection of the absolute value graph and the horizontal line $y = 6$.
<p>3 Find the points of intersection of the two graphs and solve.</p> <p>2nd F CALC 2</p> <p>2nd F CALC 2</p>		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-9900 shows absolute values with $| \quad |$, 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.