

## 2.3 Solving Equations

When you solve an equation you find values for the variables in the equation that make the equation true. When you solve an equation given as a function,  $y = f(x)$ , you find values for  $x$  and  $y$  which make  $y = f(x)$  true; geometrically, this is equivalent to finding points  $(x, y)$  on the graph of the function  $f$ . When you solve the equation,  $f(x) = 0$ , you find the *zeros of the function*  $f$ ; geometrically, this is equivalent to finding the points of intersection of the graph of the function with the  $x$ -axis.

### 2.3.1 The Solver

The **Solver** is a feature that allows you to solve an equation, **eqn**, for any variable. You can access the solver from the **MATH** menu. Press the **MATH** key, then use the up or down arrow keys to scroll to **Solver**. Press **ENTER** to access the equation editor. (See Figures 5 and 6.) If the equation editor does not appear, scroll up using the up arrow key. Use the **X,T, $\theta$ ,n** key or the ALPHA keys to enter your equation. Note that the equation is always assumed to equal zero. Press **ENTER** to activate the **Solver** as shown in Figure 7.



Figure 5: Selecting the **Solver**

The opening screen for the **solver** displays all the variables in the equation. It looks like the answer is already being displayed, but it is not. You must first enter “guesses”, or initial searching points for the variables. Edit the value of each variable by scrolling to the value of the variable and entering a

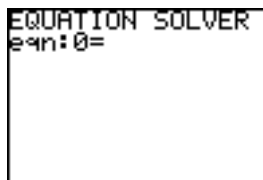


Figure 6: The Equation Editor

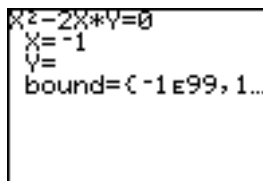


Figure 7: The Solver

new value. You also need to provide a guess for the variable for which you are solving. Also, consider editing the `bound = {lower, upper}` values. This is not always necessary but may help you find a solution more quickly, since the TI-83+/84+ searches for a solution in the interval `[lower, upper]`.

To solve, position the cursor in the variable line for which you wish to solve, then press the **ALPHA** **[SOLVE]** keys. The calculator displays an upward moving series of dashes in the upper right hand corner when it is “busy”. Finding the solution may take some time. The solution is displayed in Figure 8. The solution window contains the solution as well as the value `left-rt`, which is the difference between the left and right sides of the equation.

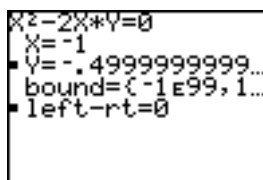


Figure 8: The equation solved

For a more detailed discussion of the Solver with the TI-83+/84+, consult the guidebook that came with your calculator.

### 2.3.2 Solve(

This feature is only available from the CATALOG. Press the yellow **2nd** key, then **[CATALOG]**; scroll down until you find `solve(`, then press **ENTER**. The format for this command is

`solve(expression,variable,guess,{lower,upper}).`

`expression` is assumed to be equal to zero. The curly braces around the `{lower,upper}` are critical. All variables, except the one for which you wish to solve, should have values assigned to them. `guess` is an initial guess for the value of `variable`, and `lower` and `upper` are bounds for the solution sought.

Once you enter all the necessary information press ENTER to compute the solution.

Your TI-83+/84+ contains other features with which you can find the solution to an equation. These are described in Section 2.4 of this manual.

It is important to note that the `solver` and `solve(` only produce one solution at a time. A different starting guess might produce a different solution. It is always a good idea to first graph the function (discussed in Section 2.4) to form an idea of what to give the calculator as a guess for a solution, and to see how many distinct solutions you should be looking for.