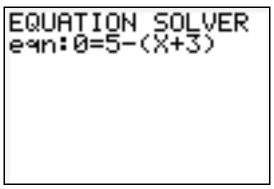
Solver Basics on the TI-83/84

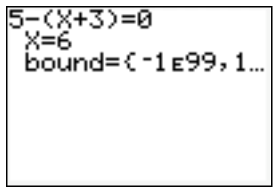
Written by Jeff O'Connell – joconnell@ohlone.edu
Ohlone College
http://www2.ohlone.edu/people2/joconnell/ti/ - A video tutorial can be found at this site

This sheet has instructions on how to solve basic equations including how to solve equations with more than one solution. For instructions on how to solve equations with more that one variable and how to store equations see, the instruction sheet *Advanced Solver* located on the website above.

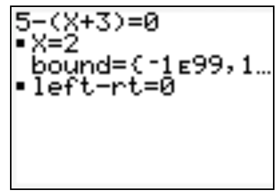
Example 1: Solve $x+3=5$. While this is a very simple equation, it will be a nice introduction to how the solver works. Press [MATH] and select `0:Solver...` under the Math menu. The equation in the solver must be set equal to 0 so enter the equation as shown in *screen 1*. Now pressing [ENTER] will display *screen 2*. Clearly $x = 6$ is not the solution. The value for x is the last value that the calculator stored for x so you may have something different than 6. The bound is where the calculator is going to look for solutions the default bound is -1×10^{-99} to 1×10^{99}. There may be times you wish to change this but it is rarely necessary. The value entered for x will be the first guess the calculator uses to find a solution. The process is this: check to see if the current value of x is a solution, if it is then done, if not then make an "educated" guess at what the solution might be and repeat the process until a solution has been reached. The "educated" guess part uses upper division Mathematics that is covered in a Numerical Analysis course. The closer the original guess is to the solution, the quicker a solution will be found. Pressing [ALPHA] [ENTER] for SOLVE will produce *screen 3*.



screen1



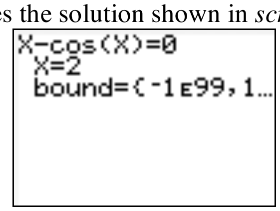
screen2



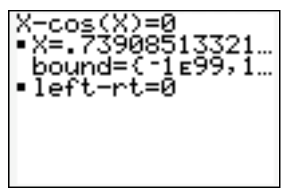
screen 3

We now have the solution $x = 2$ as desired. The *left –rt = 0* comes from the way the solver find the solution. Basically it is creating an interval that contains the solution and making the interval as small as possible. Here the interval has a length of 0 so we know that we have the exact solution.

Example 2: Solve $\cos x = x$ where x is measured in radians. This is a more realistic solver question, since no amount of Algebra or Trigonometry will solve that equation but looking at the graphs of $y=\cos x$ and $y=x$ we can clearly see a solution. After entering the equation in the solver and pressing [ENTER] you see *screen 4* (notice that $x = 2$ from the last problem). Pressing [ALPHA] [ENTER] for SOLVE produces the solution shown in *screen 5*.

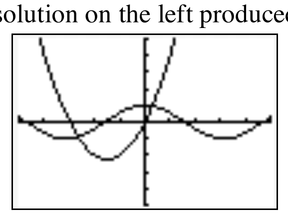


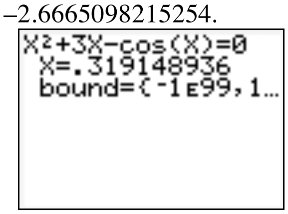
screen 4



screen 5

Example 3: Solve $\cos x = x^2+3x$ where x is measured in radians. The graphs of both sides of the equation are shown in *screen 6*, clearly there are two solutions. The solver is only able to find one solution at a time. Almost always, the solver will find the solution that is closest to the original guess, but is possible for the solver to find a solution that is not closest to the guess. The details of this is beyond the scope covered here. We can use the graph to find an initial guess. With the graph on the screen, press [TRACE] and scroll the cursor to on of the intersection points. I scrolled close to the intersection point on the right and had a value of $x\approx0.319$ (yours may be different but only slightly). Now pressing [MATH] and selecting `0:Solver...` under the Math menu produces *screen 7* which has the initial guess shown. Now pressing [ALPHA] [ENTER] for solve gives us the solution $x = .29107145078061$. Repeating the process for the solution on the left produced the solution $x = -2.6665098215254$.


screen 6



screen 7