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 than 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 \( [2^{nd}] [SOLVER] \) and enter the equation as shown in *screen 1* (don’t worry if the menu at the bottom looks different). Now pressing [ENTER] will display *screen 2*. Clearly \( x = 4 \) 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 4. The bound is where the calculator is going to look for solutions the default bound is \(-1 \times 10^{-99} \) to \( 1 \times 10^{99} \). 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 [F5] for SOLVE will produce *screen 3*.

We now have the solution \( x = 2 \) as desired. The \( \text{left} - \text{rt} = 0 \) 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 [SOLVE] produces the solution shown in *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 will solve this by using the GRAPH feature in the solver. After entering the equation into the solver and pressing [ENTER] select [GRAPH] from the menu (F1) to get the graph shown in *screen 7*. This is the graph of \( y = \cos x - (x^2 + 3x) \) or \( y = \text{(left side)} - \text{(right side)} \), that implies the solutions are where the graph intersects the x-axis. Select [TRACE] and scroll to one of the x-intercepts then press \( [2^{nd}] [SOLVER] [ENTER] \) to see the solver screen with the initial guess from the graph. When I did this for the solution on the right I got screen 8 (your guess may be a little different). Pressing [SOLVE] produced the solution \( x = -2.6665098215254 \). Repeating the process for the solution on the left produced the solution \( x = -2.6665098215254 \).