Solving Equations – Mid-Point Rule, Goal Seek and Solver

Issue date: Tuesday 30th September 2008
Hand-in date: Tuesday 14th October 2008 (*** **1pm** ***)

Barnes Wallis Computer Cluster
Location: Barnes Wallis Building (Student Assocation) 2nd Floor.

Function graphing in the Microsoft Excel environment can be achieved through the XY (Scatter) Chart. The plotted curve of points is helpful for understanding the behaviour of $f(x)$ when x varies.

The mid-point rule searches for roots by examining the change of sign of a function between two points (a and b) if it crosses the axis. Programme this in Excel using $f(a)$, $f(b)$ and $f\left(\frac{a+b}{2}\right)$, and updating the search with the IF function.

Goal Seek and Solver are intrinsic Excel macros that use iterative approaches to look for roots, or solutions for any target value, of the function. Set up Goal Seek or Solver by specifying:

- The cells to be changed
- The cells containing the function
- The solution cells
- The target function values ($f = 0$ for a root)

Think carefully about how to select starting values.

Study the following two functions in Microsoft Excel environment:

I) $f(x) = 4x^3 - 6x^2 + 1$

II) $f(x) = \frac{\left(4x^3 - 6x^2 + 1\right)\sqrt{x+1}}{3-x}$

(a) Plot the graph(s) of each function, and show the local details and overall trends.

(b) Find all roots for each function using mid-point rule searching, Excel goal seeking, and Excel Solver. Describe the searching processes.

(c) Find all local maxima and minima using Excel solver. Describe the searching process.