1 Assignment 1 - Solving Nonlinear Equations; Due to November 7, 2010

- The function $f(x) = 2x - tan(x)$ is given. Solve $f(x) = 0$ in [-1.4,1.4] as defined in next page by:
  1. Halving the Interval (Bisection) Method
  2. The Method of False Position (regula falsi)
  3. Newton's Method
  4. Muller's Method
  5. Fixed-point Iteration; $x = g(x)$ Method
- Which methods? See Table 1

Table 1: You should use the following methods depending on the last digit of your Student ID.

Last Digit	Methods
0-1	1,2,3
2-3	1,2,4
4-5	1,2,5
6-7	1,3,4
8-9	1,3,5

- Hints:

```
>> fplot('2*x-tan(x)',[-1.4 1.4])
>> [X,FVAL]=fzero('2*x-tan(x)',[-1.4 -0.5])
>> [X,FVAL]=fzero('2*x-tan(x)',[-0.5 0.5])
>> [X,FVAL]=fzero('2*x-tan(x)',[0.5 1.4])
```

- Write ***one complete function***.
  - You may use **mainmulfix.m** as a starting template for your code.
  - You can make use of the available MATLAB codes presented in the Hands-On sessions or lectures.
  - An example calling this program;

    ```
    >> myfunction(-1.4,1.4,tol_x,tol_y)
    ```

  - Tabulate the actual error $(x_n - r)$ and function values $(f(x_n))$ as given in Table 2.

Table 2: Error Sequences. The number of iterations is not limited to or defined as 15. r corresponds to exact value of root.

n	Method1 $(x_n - r)$	Method2 $(x_n - r)$	Method3 $(x_n - r)$	Method1 $f(x_n)$	Method2 $f(x_n)$	Method3 $f(x_n)$
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
12						
13						
14						
15						

  - Plot the behaviours of the errors for three methods. Analyse your plots.
  - Compare and discuss the rate of convergence (use ratios) for three methods.
  - Which method is the best and why?