

1 Assignment 1 - Solving Nonlinear Equations; Due to December 5, 2011

- The function $f(x) = 5x^2 + \sin(x) - e^x - 10$ is given. Solve $f(x) = 0$ in $[-5 \ 5]$ 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('5*x^2+sin(x)-exp(x)-10', [-5 5])
>> [X,FVAL]=fzero('5*x^2+sin(x)-exp(x)-10', [-5 -1])
>> [X,FVAL]=fzero('5*x^2+sin(x)-exp(x)-10', [-1 2])
>> [X,FVAL]=fzero('5*x^2+sin(x)-exp(x)-10', [2 5])
```

- Write one complete function.
 - You may use `mainmulfix_template.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(-5, 5, 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?