UNIVERSITY OF BOLOGNA – FACULTY OF ENGINEERING
INTERNATIONAL MASTER CORSE IN CIVIL ENGINEERING 2011/2012
INTRODUCTION TO NUMERICAL METHODS

LAB2b: NON-LINEAR EQUATIONS

In Matlab, find the roots (or zeros) of the following non-linear equations:

$$f_a(x) = x^2 - 2x + 3x = 0$$
$$f_b(x) = \ln(3x) = 0$$

by using the regula falsi (or false position) iterative method. To this purpose:

a) Create two M-files **fa.m** and **fb.m** containing the Matlab functions *fa* and *fb* implementing, respectively, the two mathematical functions f_a and f_b.

b) Create the M-file **regulafalsi.m** containing the Matlab function *regulafalsi* implementing the regula falsi root-finding method. The function must take as inputs the name of the function, the lower and upper extremes of the initial interval bracketing the root and the number of iterations to be performed, and must return as output a column vector containing the root approximations obtained by iterating the method. The first line of the M-file will be:

```
function x = regulafalsi(fun,a,b,nit)
...
```

c) Create an M-file **nonlinear.m** containing a Matlab script (the main program) that asks the user the name of the function, the initial interval and the number of iterations, then call the function *regulafalsi* and, finally, write in the Command Window and plot the array of root approximations. The first lines of the script will be:

```
clear all; close all; clc;
funname = input('name of the function: ','s');
a = input('lower extreme of the initial interval: ');
…
```

Before running the script, use the function *funplot* (LAB2a) to plot the two functions f_a and f_b and choose the initial intervals bracketing the roots.

After running the script, what about the rate of convergence of the regula falsi method?