Universidad Industrial de Santander, Colombia
Numerical Analysis, 2020-2
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Lab 3. Newton-Raphson Method

1 Instructions

- Make a **pdf** report including the solution to each point of the practice with name *Lab3_name_lastname.pdf*.
- Send the report and all created files in a rar or zip file with name *Lab3_name_lastname.rar* in the Moodle.
- You are allowed to use internet, notes, and .m files that you have created before.

2 Purposes

- To implement the Newton-Raphson method in Matlab.

3 Implementing

- (2.0 points) Create a Matlab function called *my_newton_function_name_lastname()* to find the root of a function using the Newton-Raphson method. The arguments of the function must be: the function to be evaluated $f(x)$ (as an inline function), the initial point $[p_0]$, the derivate of the function $f'(x)$ (as an inline function), and the stopping criteria (the number of iterations or the error). Make a script called *run_2a_name_lastname.m* in which you use the created function to find the three roots of the function $f(x) = x^3 + 13x^2 - 297.5x + 0.00000375e^x$. You have to choose a proper initial point for each root. For instance,

  fun = @ $XXXXXX$;
  der = @ $XXXXXX$;
  $p_0 = XX$;
  Iter=X;
  root=my_newton_function_name_lastname(fun,p_0,der,Iter);

- (1.5 points) Modify the function in the previous item such that it prints the values:
  - k : Number of current iteration
  - x_k : Value of the root at iteration k
  - $f(x_k)$: Value of the function evaluated in x_k
  - $f'(x_k)$: Value of the derivative evaluated in x_k
  - $|x_k - x_{k-1}|$: Absolute error

- (1.5 points) Create a Matlab function called *my_visual_newton_function_name_lastname()* to visualize the behaviour of the Newton method. The arguments of the function must be: the function to be evaluated $f(x)$ (as an inline function), the initial point $[p_0]$, the derivate of the function, $fp(x)$, and the number of iterations. Make a script called *run_2b_name_lastname.m* in which you use the created function to visualize the behavior of the Newton method when solving the exercise in 3 and conclude about the convergence of the method. For instance,

fun = @ $XXXXXX$;
der = @ $XXXXXX$;
$p_0 = XX$;
Iter= XX
root=my_visual_newton_function_name_lastname(fun,p_0,der,Iter);