

Lab 1. Fixed Point Method

Name: _____

1 Instructions

- Make a **pdf** report including the solution to each point of the practice with name *Lab1_name_lastname.pdf*.
- Send the report and all created files in a rar or zip file with name *Lab1_name_lastname.rar* to the mail analisis-numerico@outlook.com before 23:59, September 29, 2019. Write in the subject **AN 2019-1 Lab 1**.
- You are allowed to use internet, notes, and .m files that you have created before.

2 Purposes

- To understand the fixed point method
- To apply the fixed point method.
- To implement the fixed point method in Matlab.
- To interpret problems which can be solved by the fixed point method.
- To propose problems in which the fixed point method can be used.

3 Practice

3.1 Understanding

Investigate the nature of the fixed-point method in the function

$$g(x) = -4 + 4x - \frac{1}{2}x^2 \quad (1)$$

- (0.5 points) Create a Matlab function called *visual_verification* to show if the function has a fixed point over a range. The arguments of the function must be the range.
- (0.5 points) Solve analytically $g(x) = x$ and show that $P = 2$ and $P = 4$ are fixed points.
- (1 points) Create a Matlab function called *my_fixed_point* to find a fixed point of the function $g(x)$ with the initial point p_0 . The arguments of the function must be: the initial iteration point p_0 , and the desired number of iterations.

- (0.5 points) Use the starting point $p_0 = 1.9$ and compute $p_1 \cdots P_8$
- (0.5 points) Use the starting point $p_0 = 3.8$ and compute $p_1 \cdots P_{10}$
- (0.5 points) Find the errors E_k and relative errors R_k for the values p_k from the two previous points.
- (0.5 points) What conclusions can be drawn from Theorem 2.3?

3.2 Proposing

- (0.5 points) Propose an applied problem in which the fixed point iteration can be used.
- (0.5 points) Solve the proposed problem using the created functions.