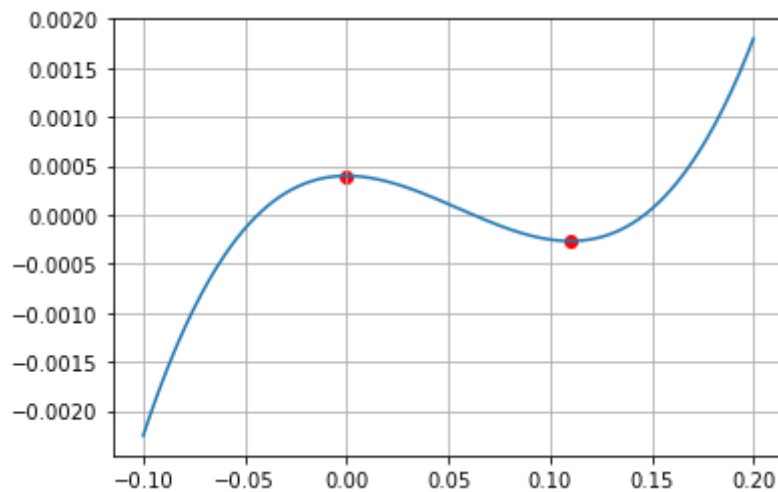


# Computational Physics Lab 3

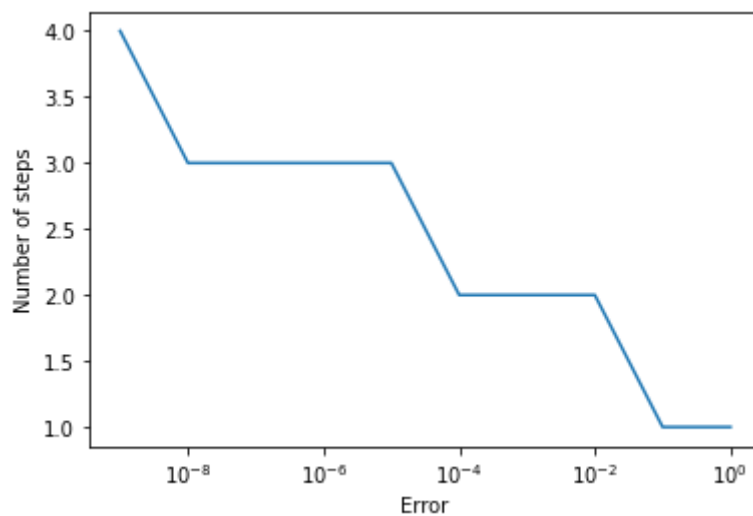
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Prathvik G S

1) Solve the equation  $f(x) = x^3 - 0.165x^2 + 3.993 \times 10^{-4}$   
using the Newton-Raphson method for a given error limit of  $e = 0.0001$



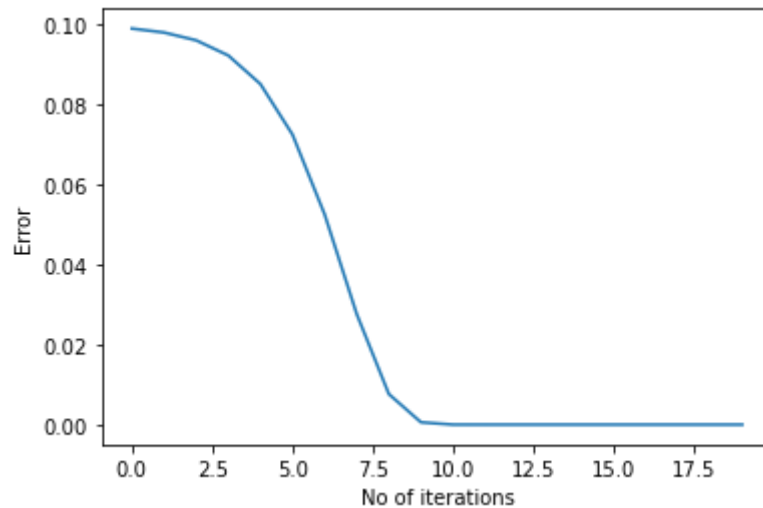
- a) Using initial guess  $x=0.05$   
We got the root to be 0.0623
- b) initial guess  $x=0.11$   
The second guess does not offer any solution as the derivative goes to 0 at  $x=0.11$
- c) Yes, we can find another initial guess which will lead to no solution which is at  $x=0$  at which the derivative goes to 0
- d) error vs number of steps required for convergence



We can see that as the error increases, the number of steps required for convergence decreases

**2) Newton-Raphson for finding reciprocal of a number: The reciprocal of a the real number  $a$  is defined as a zero of the function  $f(x) = 1/x - a$**

- a) Using  $1/x - a=0$  to find the reciprocal
- b) Plot of error propagation (comparing output and  $1/a$ ) as a function of iteration



We can see that with increasing number of iterations the error decreases

### 3) Diagonal dominance of matrix

A square matrix is said to be diagonally dominant if  $|a_{ii}| \geq \sum_{i \neq j} |a_{ij}|$

For the given matrix A it is Not strictly diagonally dominant on row 3 and 4

For the givem matrix B it is Not strictly diagonally dominant on row 2, 3 and 4