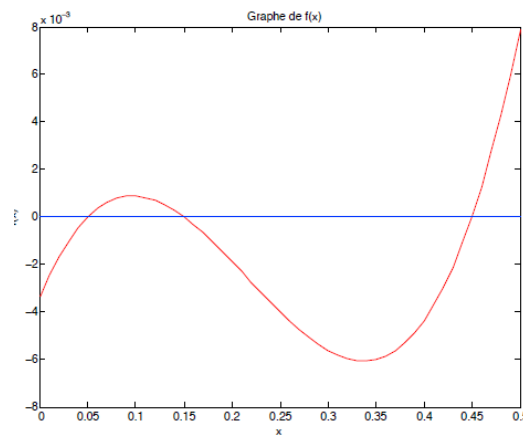


Assignment 2

Due Date: 4:00 pm Friday, Feb 12

1 (20): -Solve the last problem of laboratory 2. Please provide the procedure, governing equation, numerical differentiation and sample calculations along with the hard copy of your excel file tables/results. Please plot the velocity versus time. (Air resistance force = cV^2).

2 (30): -Assume the function $f(x)$ is plotted as follows:



a- If one wants to solve $f(x) = 0$ using the bisection method with the initial interval of $[0, 0.5]$, explain why this interval is a valid choice for this method.

b- Using this initial interval, which root of the function can be found by the bisection method? justify your answer.

c (bonus)- Using this initial interval, how many iterations for the bisection method are necessary to obtain the root with an absolute approximate relative error of 10^{-6} ?

3 (50): Assume the following equation $x + \ln(x) = 0$,

a- Use the first-order Newton's method (three iterations) with initial value of $x_0 = 0.7$ to solve the equation. Calculate the approximate relative error for each iteration.

b- Use the second-order Newton's method (three iterations) with the same initial value as part **a** to solve the equation. Calculate the approximate relative error for each iteration.

c- Compare the results from **a** and **b**.

d- One needs to solve the given equation using the fixed-point method with different forms of $x = e^{-x}$ and $x = -\ln(x)$. Determine the convergence of the method for two proposed forms. Use the initial value as in part **a** and find the solution (for the form which converges) with five iterations. Find the true relative error. (take the result of **b** as an exact (true) solution).