EE 204 - HOMEWORK 6: SOLVING ODES
Due Date: April 19, 2016 (13:30)

6 Homework

You are given a first order Ordinary Differential Equation (ODE). You are going to find the general solution of this equation with Euler's Method for specific values of x. Furhermore, you are going to compare the performance of the method for different step size(h) values.

$$y' = e^{\cos x} - y \sin x. \tag{1}$$

a. Solve and find the general solution of the ODE above where $y(0) = -2.5$. *(Hint: You may solve the equation by hand or you may also use the online solver programs or programming languages such as Matlab, Mathematica, etc.)*

b. Use Euler's method to find the values of $y(x)$ where $x = \{0.1, 0.2, 0.3, 0.4, 0.5\}$. Here $y(0) = -2.5$ and $x(0) = 0$. You are going to use 3 different step sizes which is $h = \{0.01, 0.001, 0.0001\}$.

c. Write the results to a file named "output.txt". When writing your results, you need to create a table in the file. An example is given below.

x	Exact Value	Euler Result(h = 0.01)	Euler Result(h = 0.001)	Euler Result(h = 0.0001)
0.10				
0.20				
0.30				
0.40				
0.50				

d. Write a function to calculate the percentage error which is;

$$\text{Percentage Error} = \left| \frac{\text{Exact Value} - \text{Approximated Value}}{\text{Exact Value}} \right| \times 100. \tag{2}$$

e. Calculate the percentage errors for the results you find in (c). Write this result into the same file with the form given below.

x	Percentage Error(h = 0.01)	Percentage Error(h = 0.001)	Percentage Error(h = 0.0001)
0.10			
0.20			
0.30			
0.40			
0.50			