National Taiwan University
Department of Civil Engineering
Year 105-2 CIE 7030 Earthquake Engineering
Prof. O.L.A. Kwok

Homework #1 (Online Submission: Due 11 pm, March 14, 2017)

Instruction: Please follow the order of the questions when you prepare your solution (i.e. answer Questions 1, 2, 3, 4…. but not Questions 1, 4, 2, 5 ….). Write down your assumptions and calculations clearly. Please put your answers (including plots, explanations) on a word file. Also please submit your matlab codes (m files).

Prior to working on the following questions, please read the Matlab primer (on ceiba) or any online matlab tutorials if you have never used Matlab before.

1. A square is with corners (0,0), (0,1), (1,0) and (1,1). A quarter circle with radius 1 is inscribed in the square. Please perform the following tasks (put the commands on an m-file) in Matlab.
   (i) Randomly select 1000 points whose x- and y-coordinates are between 0 and 1. (Hint: use "rand" in Matlab).
   (ii) Calculate the distance between each of these 1000 points and the origin (0,0).
   (iii) Out of 1000 points, what is the ratio of the points that are inside the inscribed circle (including those on the circle)? (Hint: use (ii))
   (iv) What is the number when you multiply the ratio in (iii) by 4.
   (v) Re-evaluate (iv) by using 10000, 100000, 1000000 points. Is there any meaning to the answer for (iv)?

2. For this question, you have to create a function m-file. Use your student ID as the name of the function (and the name of the m-file). Note: The first line of the m-file should be:
   `function [D,E,V]=YOUR_S_ID(a,b,c,d)`
   where a, b, c, d are the inputs, and D,E,V are the outputs.

   The Taylor expansion of the exponential function is given by:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

   (i) Create a function m-file which can calculate the Taylor expansion of the exponential function. The input should be x whose value will be specified by the user when the function file is called. The function file should be able to calculate e^x when $n = 0,1,2,3,.....10$ are used, hence the output should include 11 estimated values.
   (ii) On another m-file, call the function file from (i) twice to evaluate $e^{0.2}$ and e^2. Then create a plot whose x-axis and y-axis are n and the estimated value of e^x respectively. The graph should contain 2 sets of results, one for $e^{0.2}$ and one for e^2.