Math 4329, CRN 21457 **Homework 01**

Dr. Natasha Sharma **Due on January 30th 2018**

Please read the following instructions carefully

- In order to secure full credit, please show all the working.
- You may work in groups but the assignments have be written by yourself.

1. Bound the error in using $p_4(x)$ to approximate e^{-x} about $a = 0$ on [-1,1] with the Taylor's remainder.

2. Let $p_n(x)$ be the Taylor polynomial of degree n of the function:

$$\boxed{\text{f(x)= log(1-x) about a=0.}}$$

(a) How large should n be to have $|f(x) - p_n(x)| \leq 10^{-4}$ for $-0.5 \leq x \leq 0.5$?

(b) Does this choice of n change if x lies between $[-1, 0.5]$?

3. For each of the following functions $f(x)$ and choice of approximation point $a = 0$, please generate the Taylor polynomials of degree 1, 2 and 3.

(a) $f(x) = \sqrt{x+1}$,
(b) $f(x) = \log(1+x)$,
(c) $f(x) = e^{\cos x}$.

Use the Matlab commands `plot, hold on, legend` to generate the plots of each of the three functions $f(x)$ and the three polynomials superimposed on the Matlab plot.
Your plot must have a title 'Plot 01', 'Plot 02' and 'Plot 03' and the legend indicating the three polynomials p1, p2 p3. Please turn in a printout of each of the three plots.

4. Assuming the `format short`, in Matlab, use the Matlab command `rand(1)` to generate a random number between 0 and 1. Call this variable `n`. Multiply `n` by 100 so that `n` is of the form xx.xx.
Perform the following tasks:

(a) Find the binary floating-point representation and the machine representation in IEEE double precision format for the number by hand. Show complete working of this problem.

(b) Use the Matlab command `format hex` and proceed as in example of (2.6)-(2.7) of the textbook to generate the binary double precision format for `n`. Please describe all the steps you performed to arrive at this answer especially the output Matlab prints to the screen.