

AMAT3132 – Numerical Analysis, Winter 2010

Home work 1 (show all works)

Due Monday Jan 25, 2010 by 24:00 in the drop box#40
Full marks $3 \times 10 = 30$

Instruction: (i) Please hand in the paper copy of the assignment into the box #40 located next to Math general office in HH.

(ii) Please submit your matlab code in ONE executable file using the “submit assignment” utility. You MUST have one executable **.m** file for the entire assignment. (iii) The due date is the same for both the code or the paper copy.

- (a) Develop an algorithm that converts a decimal (*i.e.* base-10) integer to a binary number. Submit the paper copy of your algorithm.
(b) Write a MATLAB function of the form

$$[\text{return_value}] = \text{function_name}(\text{input}\dots)$$

that implements your algorithm to convert a decimal number to a binary number.

- (c) Convert and report the last 4-digits of your student number to binary form.
(d) Verify your developed code. Convert the following base-10 numbers to base-2 numbers and compare your results with Matlab’s built-in function `dec2bin()`.

base-10	base-2	dec2bin
4-digits of ID		
191		
396		
3196		
9164		

- (a) Consider the Taylor’s series of the given function $f(x)$. Truncate the series to $f_n(x)$ retaining n terms for $n = 1, 2, 3, 4$. Use $f(x) = \ln(1 + x)$ and

write a MATLAB function of the form

$$[\text{return_value1}, \dots] = \text{function_name}(\text{input1}, \dots)$$

to answer following problems.

- (b) Find the truncation error of $f_n(x)$ for each n at $x = 0.5$
 - (c) Find the relative truncation error of $f_n(x)$ for each n at $x = 0.5$. How many significant digits are used for each approximation?
 - (d) Plot relative truncation errors in $f_n(x)$ for each n in the interval $[1, 4]$ for various values of x in the range $0 \leq x \leq 1$. (you will have 4 $f(x)$ versus x plots).
3. Please submit print outs of plots along with your paper copy and submit your code electronically.

- (a) Consider the following equations:

$$x(t) = 3 \cos 2t, \quad y(t) = 5 \sin 3t, \quad 0 \leq t \leq 2\pi.$$

Develop a MATLAB function to plot x versus t , y versus t , and y versus x . Submit print outs only for each plot.

- (b) Consider the surface defined by $z = (x^2 - y^2)e^{-x^2 - y^2}$ for $-3 \leq x \leq 3$ and $-3 \leq y \leq 3$.

Develop a MATLAB function to plot the surface and submit the print out of the surface.