PROBLEM SET NUMBER 1
Due Monday, October 6, 2008 (in lecture)

Reading Assignment for week of September 29.

Read the Chapra & Canale Chapter on "Approximations and Round-Off Errors".

Problem Set # 1

This Problem Set is to be done by your team. Teams will be assigned this week of September 29. Note that this first problem set will require the use of MATLAB.

Learning Objectives for Week of September 29

1. Learn concepts of machine representation of real numbers.
2. Compute and use true and approximate errors.
3. Observe how the machine representation of numbers affects the precision of computations.
4. Learn the difference between stability and conditioning of a problem.
5. Learn applications of numerical differentiation as derived from Taylor Series.

Assignment

1.- Write the sequence of commands

```
x=0;
while x~=10
   x=x+deltax
end
```

in a MATLAB script file. Execute the file for two values of the variable deltax: 0.1 and 0.125. Give an interpretation of the different behaviours observed.

2.- Consider the equation

$$ax^2 + bx + c = 0. \tag{1}$$

1. Write a first function (**mala.m**) giving the roots of (1) by using the standard formulas for the roots. Include the complex case and a test to ensure that a in not zero.
2. Write a second function (**buena.m**) by using the alternative expressions

$$x_1 = \frac{L}{2a}\,,\; x_2 = \frac{2c}{L},$$

   where $L = -b - \text{sign}(b)\sqrt{b^2 - 4ac}$.
3. Discuss the advantages of **buena.m** and provide an illustrative example.