Introductory Computer Sciences
Problem set #6
Functions

1. Create a factorial function that prompts the user to enter a valid number until a non-negative scalar number entered as the function input.

2. A store owner asks you to write a program for use in the checkout process. The program should:

   - Prompt the user to enter the cost of the first item.

   - Continue to prompt for additional items, until the user enters 0.

   - Display the total.

   - Prompt for the amount the customer submits as payment.

   - Display the change due.

3. Write your own MATLAB function to compute the exponential function directly from the Taylor series:
$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

   The series should end when the last term is less than 10^{-6}. Test your function against the built-in function *exp*, but be careful not to make x too large-this could cause rounding error.

4. Write a function

   function [x1, x2, flag] = quad(a, b, c)

   which computes the roots of the quadratic equation $ax^2 + bx + c = 0$. The input arguments a, b and c (which may take any values) are the coefficients of the quadratic, and $x1$, $x2$ are the two roots (if they exist), which may be equal. The output argument flag must return the following values, according to the number and type of roots:

   - 0: no solution ($a = b = 0$, $c \neq 0$);

   - 1: one real root ($a = 0$, $b \neq 0$, so the root is $-c/b$);

   - 2: two real or complex roots (which could be equal if they are real);

   - 99: any x is a solution ($a = b = c = 0$).

5. Use the Taylor series
$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$$

   to write your own function to compute $\cos(x)$ correct to four decimal places (x is in radians). Test your function with the MATLAB function *cos*. Do not make x too large; that could cause rounding error.