**6.3 Try to walkthrough the following program and write down the expected results. Key-in the program and compare the results after execution.**

```
/* This program shows the use of user-defined functions.*/

#include <stdio.h>
#include <stdlib.h>

double Power (float x, int y);

int main (void)
{
   int Index;
   float Num;
   char Choice;

         printf("\nStart program.\n");
   do
    {
         printf("\nPlease enter a real number : ");
         scanf("%f", &Num);
         printf("Please enter an integer for power : ");
         scanf("%d", &Index);
         printf("\n%8.2f\tto the power %4d", Num, Index);
         printf("\tis %10.4f", Power(Num, Index));
         printf("\n");
         printf("\nDo you want to try again (y/n)? ");
         scanf(" %c", &Choice);
    } while ((Choice == 'y') || (Choice == 'Y'));

         printf("\nEnd program.");
         printf("\n");
         return 0;
}

double Power (float Num, int Index)
{
   int i;
   double Product;

         for (Product =1, i=1; i <= abs(Index); i++)
                  Product *= Num;
         if (Num == 0.0)
                  Product = 0;
         else if (Index < 0)
                  Product = 1/Product;
         return Product;

}
```

**Sample running:**

Start program.

Please enter a real number : *2.0*<CR>
Please enter an integer for power : *3*<CR>

Do you want to try again (y/n)? *y*<CR>

Please enter a real number : *2.6*<CR>
Please enter an integer for power : *4*<CR>

Do you want to try again (y/n)? *y*<CR>

Please enter a real number : *2*<CR>
Please enter an integer for power : *-2*<CR>

Do you want to try again (y/n)? *n*<CR>

End program.

**Task : In mathematics, the exponential function $e^x$ can be written as an infinite series.**

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots + \frac{x^n}{n!} + \ldots$$

**$n$! is defined as $(n)(n\text{-}1)(n\text{-}2)\ldots(2)(1)$ where $n$ is a positive integer and 1! / 1.**
**For example 2! = 2(1) = 2**
**3! = 3(2)(1) = 6**
**4! = 4(3)(2)(1) = 24**
**etc.**

**(a) Write a function**
***double Exponential (float x)***
**that finds the value of $e^x$ by the series up to $n$ = 20.**

**Hint : Make use of the function *double Power (float x, int y)* to find the $x^y$ and write a function *double Factorial (int x)* to find $x$!**

**(b) Test your function by writing a program to accept a real number $x$ and calculate $e^x$ by the function written.**

**Sample running :**

Start program.

Please enter a real number : ***1.0***<CR>

e to the power 1.000000 is 2.7183

Do you want to try again (y/n)? ***y***<CR>

Please enter a real number : ***2.0***<CR>

e to the power 2.000000 is 7.3891

Do you want to try again (y/n)? ***y***<CR>

Please enter a real number : ***3.5***<CR>

e to the power 3.500000 is 33.1155

Do you want to try again (y/n)? ***n***<CR>

End program.