**Homework 9**

**Please do not use array in this lab.**

**Please** **print out the answers in the main** function

1. Write a program to approximate the value of sin(x) using the formula:

 (值由keyboard key in ).

The program stops when || < .

Once the term is less than , this term “should not” be added into the sum.

**Input x in the main function** and pass this data to the following functions by value:

Case I:

Write one value return function and use **one while loop** to calculate the sin value in the function body and then display the result to the **14th** decimal place in the main.

Case II:

**Write one value return recursive function to calculate the sin value** and display the result to the **14th** decimal place in the main**.**

Case III:

Use the same input to call the **sin** function in the **math.h** and display the result to the 14th decimal place in the main.

**The input will stop when you enter Ctrl D**.

**Input/Output Example:**

-0.1

The sin(-0.100000) is -0.09983341664683

The sin(-0.100000) is -0.09983341664683

The sin(-0.100000) is -0.09983341664683

2

The sin(2.000000) is 0.90929742682564

The sin(2.000000) is 0.90929742682564

The sin(2.000000) is 0.90929742682568

-2

The sin(-2.000000) is -0.90929742682564

The sin(-2.000000) is -0.90929742682564

The sin(-2.000000) is -0.90929742682568

3.1415926

The sin(3.1415926) is 0.00000005358962

The sin(3.1415926) is 0.00000005358962

The sin(3.1415926) is 0.00000005358979

^D

1. Please use **recursive** function to compute the following:

(a). S =  +  +  + … + 

Let the user input the number n and show the answer to the 8th decimal place.

Stop the program when inputting **CTRL+Z**.

Hint: Think about when **n** becomes to 2 what the value of this term

**Input/Output Example:**

Please input n: 30

0.96666667

Please input n: 1

illegal input

Please input n: 15

0.93333333

Please input n: ^Z

(b). π= 4 \* \* \* \* \* …\* **\***

Please write a recursive function to calculate the equation. Let the user input the

number n and show the answer to the 8th decimal place.

Stop the program when inputting CTRL+Z.

Hint: You may consider ( \* ), ( \* ), …as one pair and let n=0 as 4

**Input/Output Example:**

Please input n: 1000

3.14237737

Please input n: 10000

3.14167119

Please input n: ^Z

(c). Please write a recursive function double approxiPI() to find the approximated value

of until the error between M\_PI in math.h and your value is smaller than 10-4. (judge the error and calculate n in approxiPI()).

Please print out the number of n in 2(b) equation for your approximated .

Please show your approximated to the 8th decimal place. In this problem,

you can print 'n' in either the main function or approxiPI().

Hint:To use the constant M\_PI in the math.h you need to add the following into your

program:

#define \_USE\_MATH\_DEFINES

#include<math.h>

**Input/Output Example:**

<math.h> M\_PI: 3.14159265

n: 7854

myPI: 3.14169264

1. Write a program that inputs two numbers: x and y. (data are all integers) in the main

program and passes these two numbers ( pass by value) to the recursive function:

***power*** that returns the .

If y ≧0, 1 if y=0

*power(x, y)* = x if y=1

x\**power(x,y-1)* if y>1

If y<0

*power(x, y)*=

Please print the result in the main program and show the answer to the 8th decimal

place. The program should be able to execute repeatedly until user entering Ctrl-D.

**Input/Output Example:**

x,y = 2 10

power(x, y)= 1024.00000000

x,y = 2 -10

power(x, y)= 0.00097656

x,y = ^D

4. A robot can take steps of 1 meter, 2 meters and 3 meters. Write a recursive function to

evaluate the number of ways the robot can walk n meters. Let the user input the number

**n.** Please print out the answers in the main function. Stop the program when inputting

**CTRL+Z.**

**Input/Output Example:**

n = 3

4 ways

n = 5

13 ways

n = 10

274 ways

n = ^Z

1. Suppose that we have a 2 × n rectangular board divided into 2n squares. Please write a recursive function that computes the number of ways to cover this board exactly by 1 × 2 dominoes. Let the user input the number n. Please print out the answer in the main function. Stop the program when inputting CTRL+D.

**Input/Output Example:**

n= 10

89 ways

n= 43

701408733 ways

n= ^D