

Homework 10

1. Please use recursive function to compute the following:

$$(a). S = \frac{1}{1*2} + \frac{1}{2*3} + \frac{1}{3*4} + \dots + \frac{1}{n*(n-1)}$$

(Think about when n becomes to 2 what the value of this term)

$$(b). \pi = 4 * \frac{2}{3} * \frac{4}{3} * \frac{4}{5} * \frac{6}{5} * \frac{6}{7} * \frac{8}{7} * \dots$$

(You may consider $(\frac{2}{3}$ and $\frac{4}{3})$, $(\frac{4}{5}$ and $\frac{6}{5})$, $(\frac{6}{7}$ and $\frac{8}{7})$, ... as one pair and let n=0 as 4)

(c). (加分題,可不寫) From (b) and using the constant M_PI in the math.h to find the approximated value of π till the error between M_PI and your approximated value π reduces to 0.005.

2. 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 x^y .

If $y \geq 0$,

$$\text{power}(x, y) = \begin{cases} 1 & \text{if } y=0 \\ x & \text{if } y=1 \\ x * \text{power}(x, y-1) & \text{if } y>1 \end{cases}$$

If $y < 0$

$$\text{power}(x, y) = \frac{1}{\text{power}(x, -y)}$$

Print the result in the main program.

3. A robot can take steps of 1meter, 2 meters and 3 meters. Write a recursive function to evaluate the number of ways the robot can walk n meters.

4.(加分題, 可以不寫) This is an extra point question, you may not write.

A robot can take steps of 1 meter, 2 meters. Write a function that lists all of the ways that the robot can walk n meters.

5. (加分題, 可以不寫) This is an extra point question, you may not write.

Suppose that we have a $2 \times n$ rectangular board divided into $2n$ squares. Write a function that computes the number of ways to cover this board exactly by 1×2 dominoes.