Please complete the textbook sections 6.1 and 6.2 before beginning this assignment.

CS 278
PA 7: Recursion

All programs you submit in this class must follow the Documentation and Style Guidelines. This document can be found in the Canvas Modules.

All programs you submit in this class must compile with the Oracle Java compiler on the Linux machines in SH 118 or SH 118B.

Before you begin, you may want to review recursion from CS 172. You can find a Powerpoint presentation and a practice problems here. https://www.cs.nmsu.edu/~esteiner/cs172/

Reminder: Copying code will result in a grade of zero for this assignment

Java Byte: You will find the method Double.toString(double value) helpful.

Program: Pi.java

Method 1: valueOfPi

Write a public, static, recursive method named **valueOfPi** that will calculate the value of pi based on the sequence.

$\pi = \sum_{i=1}^{n} \frac{4}{2n-1} * -1^{n-1}$

You cannot use any Math class methods inside the valueOfPi method.

The first few terms in this sequence are: $\pi = \frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \cdots$

The method has one parameter, an integer named **n**.

The method should return a double value, the sum of the first n terms of the sequence.

You may assume that the value of n is positive. You do not have to check for this.

You must write the base case first and label it with a comment.

The recursive step must be placed after the base case. Label the recursive step with a comment.

Method 2: correctDigits
Write a public, static, non-recursive method named correctDigits that will accept a double parameter named **number**. The method should compare, one-by-one starting at the left, the digits of number with the digits of Java's value of pi (Math.PI).

When it reaches the first non-matching digit, the method should return.
When it reaches the end of **number**, the method should return.

Note: The decimal point does not count as a digit.

For example:

Java's Math.PI = `3.141592653589793`

```
correctDigits( 4.0 ) should return 0
correctDigits( 3.142892891039832 ) should return 3
correctDigits( 31.432123575 ) should return 0
correctDigits( 13.141592653589793 ) should return 0
```

Method 3: main
Write a main method that uses valueOfPi and correctDigits to determine

1) how many terms of the sequence you are able to include
   and
2) how many correct digits of pi you are able to achieve

before your computer runs out of memory (Exception "java.lang.StackOverflowError").

Additional file: Answers.txt

In JGrasp, create a text file named Answers.txt. Copy these two questions to the file and write the answers that you obtained

How many terms of the sequence were you able to include?

How many correct digits of pi were you able to achieve?

Save the file.

Submit Pi.java and Answers.txt on Canvas.