

CMPSCI 182 – Project 1
Recursion and ADT's
30 points total
Due 9/11/17

1. This problem considers two ways to compute x^n for some $n \geq 0$.
 - a. Write an **iterative** method *power1* to compute x^n for $n \geq 0$.
 - b. Write a **recursive** method *power2* to compute x^n by using the following recursive formulation:

$$x^0 = 1$$
$$x^n = x * x^{n-1} \text{ if } n > 0$$

- c. Write an accompanying main method which invokes both *power1* and *power2* for increasing values of n up to $n = 32$. (5 points)
2. The n^{th} Harmonic number is the sum of the reciprocals of the first n natural numbers:

$$H(n) = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots + \frac{1}{n}$$

Write a **recursive** method and accompanying main method to compute the n^{th} Harmonic number. (5 points)

3. Consider an ADT list of integers. In Windows Notepad, or some other text editor, write a method that computes the sum of the integers in the list *aList*. The definition of your method should be independent of the list's implementation, meaning that your method should use a generic *aList.get(i)* method to obtain each integer from the list. In other words, **you cannot assume that the integers are stored in an array, and so you cannot use array notation such as *sum += aList[i]* to sum the integers in *aList*.** (5 points)
4. Design and implement an ADT **CreditCard** that represents a credit card. The data of the ADT should include Java variables for the customer name, the account number, the next due date, the reward points, and the account balance. The initialization operation should set the data to client-supplied values. Include operations for a credit card charge, a cash advance, a payment, the addition of interest to the balance, and the display of the statistics of the account. Be sure to include a main class which creates an object from your *CreditCard* class. (15 points)