ASSIGNMENT 3
HPC1 Fall 2014

Due Date: ***Thursday, October 23***
(please submit your report electronically to the instructor via email, as one PDF file named *hw3-yourUBitname.pdf*)

Problem 1: Write a program to compute π by the summation:

$$\frac{\pi}{4} = \sum_{i=0}^{N\to\infty} \frac{(-1)^i}{2i+1},$$

and use **OpenMP** to parallelize the code. Determine the performance of your code as a function of N terms in the sum, and N_p processors. Note that, depending on the granularity of your timer, it may well be necessary to repeat the calculation (say j times, such that jN is a convenient timing interval) and time the total to get reliable average times, especially for smaller values of N. Plot the execution time, parallel speedup, and parallel efficiency as a function of N_p (note the utility of logarithmic scales!). Make careful note of what machine type you are using to perform this study, and for best comparative results versus **MPI** you will want to be consistent in your choice of nodes for the second problem.

Problem 2: Repeat problem 1 using **MPI** instead of **OpenMP**.

Hint: simple pseudo-code for splitting the sum into N_p partial sums might look something like:

```
myID = MyProcNumber()
Np = TotalProcNumber()
mySum = 0
do i=myID*(NsumTerms/Np)+1,(myID+1)*(NsumTerms/Np),2
    mySum = mySum + 1.0/(2*i-1)
    mySum = mySum - 1.0/(2*i+1)
end do
CollectPartialSums(S)
```