Lab 2

Goals: The objectives of this lab are to implement two approaches to sort a real one dimensional array in ascending order; the methods we use are selection sort and insertion sort.

1. Implement the Selection Sort algorithm for sorting an array of n real numbers in *ascending order*. You should write a function whose input is the array to be sorted and the output is the sorted array. Test your algorithm with an array of 25 randomly generated numbers which range between 1 and 100. See the Matlab command section if you need help in generating such an array.
2. Implement the Insertion Sort algorithm for sorting an array of n real numbers in ascending order as in (1).
3. Show in the PDF for each sorting algorithms the array ($n = 25$) before and after sorting.
4. Plot the performance of both sorting algorithms in a log-log plot and discuss similarities or differences in their performance. You can do this by getting the time to run your sort function for n numbers and then plot the log time versus the log size of the array to sort. For example in pseudocode

```
X = [ 10,100,1000,10000,100000]
for N in X do
a = random array of size N
starttime = get starttime
sort(a)
endtime= get endtime
record (endtime-starttime) and put into X
record N and put into Y
end
plot log(X) versus log(N)
```

5. Turn in the PDF and .m files (in an tar.gz archive).

Matlab Syntax:

In (1) and (2) you need to generate a one-dimensional array of randomly generated numbers. Recall that Matlab has a built in command for this. For example, to generate a single random number you use x=rand(1); to generate an array of ten numbers between zero and one we use the command

$$x = \mathrm{rand}(1, 10)$$

there is a similar command to get integer random numbers `randi`, check it out here:
http://www.mathworks.com/help/matlab/ref/randi.html

You can measure the time of a function using the matlab functions `tic` and `toc` for example

```
starttime = tic;
your_function();
endtime = toc;
toc - tic
```

Matlab tutorial: http://www.mathworks.com/academia/student_center/tutorials/launchpad.html