CS 173
Homework 6:Sorting
Due Friday, April 12

Complete this project with a randomly assigned partner. See the Notebowl assignment page for partners.

In this problem, you will compare the running times of four sorting algorithms: selection sort, insertion sort, merge sort, and quicksort. We discussed selection sort, merge sort, and quicksort in class and you can also read about them in your textbook. Insertion sort, the algorithm most people use to sort a hand of cards, is described on page 466-7 of your textbook.

Write functions for each of the four sorts. Each function should take a vector of integers as a reference parameter.

Use the `gettimeofday()` function from `sys/time.h` to time each of the four sorts on a sequence of randomly generated lists with increasing lengths between 1000 and 100,000, in increments of 1000. The following snippet of code illustrates how to use `gettimeofday()`. You can learn more by typing `man gettimeofday` in the terminal.

```
#include <sys/time.h>

int main()
{
   timeval timeBefore, timeAfter;    // timeval type defined in sys/time.h
   long diffSeconds, diffUSeconds;   // elapsed seconds and microseconds

   gettimeofday(&timeBefore, NULL);  // get the time before

   selectionSort(list);

   gettimeofday(&timeAfter, NULL);   // get the time after

   diffSeconds = timeAfter.tv_sec - timeBefore.tv_sec;    // elapsed seconds
   diffUSeconds = timeAfter.tv_usec - timeBefore.tv_usec; // elapsed microseconds

   double time = diffSeconds + diffUSeconds / 1000000.0;  // total elapsed time

   return 0;
}
```

Plot your results using the tool of your choice. Your plot should have input size on the x-axis, time on the y-axis, and four "curves" for the four algorithms then save the plot as a PDF. Submit your code (all in one file) and the PDF plot by the deadline.

Important note: In your tests, make sure that you never use a list that has been previously sorted! This will significantly skew your results.