Reminder: You may work in groups and use outside sources. But, you must write up solutions in your own words and properly reference your sources for each problem. This includes listing your collaborators and properly citing any sources you use. Solutions to each problem must be electronically typeset and submitted online via Blackboard. Instructions appear in the E-Homework Guide: http://www.cse.wustl.edu/~bjuba/cse347/s17/ehomework/ For all problems in this course, your solutions should provide a proof of both correctness and a running time bound, unless the problem explicitly states that this is not necessary.

Some advice: When trying to solve the first two problems, you should read through Section 8.10 of Kleinberg & Tardos, which is a rather helpful guide to determining NP-completeness. Note that you can use any of the problems listed there for your reductions.

1. Kleinberg & Tardos – Chapter 8, exercise 19
2. Kleinberg & Tardos – Chapter 8, exercise 32
3. Kleinberg & Tardos – Chapter 13, exercise 4
4. Recall the algorithm insertion sort:

```plaintext
input : Array A of n integers
begin
    for i = 1, ..., n do
            Swap A[j-1] and A[j].
end
```

Suppose A contains n integers in a uniformly chosen random order. What is the average (expected) running time of insertion sort?