CS 577: Introduction to Algorithms	Homework 3
Out: 02/15/18	**Due: 02/22/18**

Ground Rules

- The homework is worth 5 points (out of a total of 100 points you can accumulate in this course).
- The homework is to be done and submitted in pairs. You can partner with someone from either section.
- The homework is due at the beginning of either lecture on the due date.
- No extensions to the due date will be given under any circumstances.
- Turn in your solution to each problem on a **separate sheet** of paper (or sheets stapled together), with your names clearly written on top.

Problems

1. **(Worth: 2 points. Page limit: 1 sheet; 2 sides)** Solve Problem 12, **Racetrack**, on Page 12-13 of Chapter 18 in the book "Algorithms, Etc." Your algorithm should run in time $O(n^4)$. Please provide a proof of correctness and running time.

   Link: `http://jeffe.cs.illinois.edu/teaching/algorithms/notes/18-graphs.pdf`.

2. **(Worth: 3 points. Page limit: 1 sheet; 2 sides)** Sometimes there are multiple shortest paths between pairs of nodes in a graph. Develop an algorithm for the following task: given an undirected graph $G = (V, E)$ with unit edge lengths and nodes v and w, output the number of distinct shortest paths from v to w. For example, for the graph below, on input v and w your algorithm should output 2. Your algorithm should run in linear time. Prove the correctness of your algorithm and analyze its running time.