Concordia University
Concordia Institute for Information Systems Engineering

INSE 6441 Game Theory, Winter 2017

Assignment 2, Due April 7, 2017

Each question is worth 25 percent.

1. Fudenberg and Tirole: Exercise 4.5.

2. (Auction with a reserve price) Consider a second-price auction with two players. Each player's valuation is uniformly distributed on $[0, 1]$, and the two valuations are independent random variables. However, there's a fixed reserve price $r > 0$ that is common knowledge with the buyers: if the two bids are below the threshold r, then there's no winner.

   - Find a Bayesian Nash Equilibrium.
   - What is the winner's expected payment?

3. (Common-value auctions) Consider a second-price auction with two player where the player types are random variables t_1, t_2 and their valuations are the same:

   $$v_1 = v_2 = t_1 + t_2.$$

   Assume that t_1 and t_2 are again uniformly distributed on $[0, 1]$ and indepedent.

   - Find a Bayesian Nash Equilibrium.
   - What is the winner's expected payment?

4. (Mechanism design) Design a VCG-like mechanism for ridesharing. Suppose that there are k travelers, each traveler i is described by two points in $\mathbb{R}^2$: the starting point x_i in the quadrant $\{(a, b) \in \mathbb{R}^2 : a < 0, b < 0\}$ and the end point y_i in the quadrant $\{(a, b) \in \mathbb{R}^2 : a > 0, b > 0\}$. There's a single taxi that starts at the point $(0, 0)$, then goes to pick up all the k travelers in the best possible order (minimum distance traveled), then goes back to the point $(0, 0)$, and finally drops off each traveler i at its destination y_i in the best possible order. Describe the set of outcomes, and the payments for each traveler.

5. (Bonus) Implement on a computer an algorithm that computes the outcome and payments for question 4.