

CAP-4630 Homework 4

Deadline: 12/1 (Friday) at 2:00 PM on Moodle

1. Exercise 13.3 from textbook. (10 pts)
2. Exercise 13.4 from textbook. (10 pts)
3. Exercise 13.8 from textbook. (10 pts)
4. Exercise 13.12 from textbook. (10 pts)
5. Exercise 13.13 from textbook. (10 pts)
6. Exercise 13.14 from textbook. (10 pts)
7. Exercise 13.15 from textbook. (10 pts)
8. Exercise 13.19 from textbook. (10 pts)
9. Exercise 14.1 from textbook. (10 pts)
10. Exercise 14.2 from textbook. (10 pts)
11. Exercise 14.4 from textbook. (10 pts)
12. Exercise 14.6 from textbook. (10 pts)
13. **Three-card Poker (55 pts)**

In three-card poker, two players are both dealt a card from a deck consisting of a king (K), a queen (Q) and a jack (J) (the final card is not dealt). Both players ante \$1, and player 1 (P1) is first to act. He has two choices: he can bet \$1 (B) or check (C). If P1 bets, player 2 (P2) can either call or fold. If P1 bets and P2 calls, then whoever has the higher card ($K > Q > J$) wins the entire pot of \$4. If P1 bets and P2 folds, then P1 wins the pot of \$2. If P1 checks, then P2 can either bet or check. If P1 checks and P2 checks, then whoever has the higher card wins \$2. If P1 checks and P2 bets, then P1 can call or fold. If P1 calls, then whoever has the higher card wins \$4. If P1 folds, then P2 wins \$2.

We suggest using the Gambit software package to solve this problem, as described in lecture.

- (a) Draw the extensive-form game tree of this game. (10 pts)
- (b) How large would the equivalent normal-form representation of this game be? Note that you do not need to explicitly write down the normal-form representation of this game. (5 pts)
- (c) Say that an action a for player i at information set s in an extensive-form game is weakly dominated if there exists another action b at the same information set, such that for all leaf nodes n_x reachable by playing action x at s , we have $u_i(n_b) \geq u_i(n_a)$. Based on your extensive-form representation, perform iterated elimination of weakly dominated actions and list all actions that end up being eliminated for each player. (10 pts)
- (d) Now reconstruct the extensive-form representations of the game from part a with the dominated actions eliminated. (5 pts)
- (e) Write down the equivalent normal-form representation of the game you just constructed in part d. (5 pts)
- (f) What is one equilibrium of this game? What is the value of the game to player 1? You can use any method you want, but must show your work and justify your answer. (10 pts)
- (g) What are all of the equilibria of this game? You can use any method you want, but must show your work and justify your answer. (10 pts)

Hint: There are infinitely many equilibria, so you should provide as detailed a description as possible of the set of equilibria. For example, you could give a parameterized strategy for each player, and say what sets the parameters can range over. Of course, your parameterized strategies should include your answer to 2(f) as a special case.