Feedback — Problem Set 3

You submitted this homework on **Tue 22 Jan 2013 1:21 PM CET**. You got a score of **5.00** out of **5.00**.

Question 1

Iterated removal of strictly dominated strategies

Normal			
1 \ 2	L	M	R
U	3,8	2,0	1,2
D	0,0	1,7	8,2

We say that a game is *dominance solvable*, if iterative deletion of strictly dominated strategies yields a unique outcome. True or false: Is the previous game dominance solvable? Consider both pure strategies and mixed strategies.

Your Answer		Score	Explanation
a) True;	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

(a) is correct, the previous game is dominance solvable.

- For player 2, R is dominated by a mixed strategy between L and M (for example, play L with probability $1/2$ and M with probability $1/2$).
- Once R is removed, for player 1 D is dominated by U.
- Finally, once R and D are removed, M is dominated by L.
- Since the process of iterative deletion of strictly dominated strategies yields the unique outcome (U, L), the game is dominance solvable.

Question 2

Iterated removal of weakly dominated strategies

In order to illustrate the problem that arises when iteratively eliminating **weakly** dominated strategies, consider the following game:

Normal			
1 \ 2	L	M	R
U	4,3	3,5	3,5
D	3,4	5,3	3,4

True or false: in the above game the order of elimination of **weakly** dominated strategies does not matter (that is, the final outcome is the same regardless of the order in which weakly dominated strategies are eliminated.). [Hint: start the process of iterative elimination of **weakly** dominated strategies by eliminating different strategies at the beginning of the process.]

Your Answer		Score	Explanation
b) False.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

(b) is correct, in the previous game the order of elimination of weakly dominated strategies does matter.

- Consider the following attempts:
- If we start by eliminating the weakly dominated strategy L:
  - For 2, L is weakly dominated by R.
  - Once L is removed, for 1 U is weakly dominated by D.
  - Once L and U are removed, M is strictly dominated by R.
  - The outcome of this process of elimination is (D, R).
- If we start by eliminating the weakly dominated strategy M:
  - For 2, M is weakly dominated by R.
  - Once M is removed, for 1 D is weakly dominated by U.
  - Once M and D are removed, L is strictly dominated by R.
  - The outcome of this process of elimination is (U, R).
- Then, the order of elimination of **weakly** dominated strategies does affect the outcome of the process.

Question 3

Minimax

Consider the matching-pennies game:

1\ 2	Left	Right
Left	2,-2	-2,2
Right	-2,2	2,-2

Which is a maxmin strategy for player 1:

Your Answer		Score	Explanation
c) Play Left and Right with probability 1/2.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

(c) is true.

- Recall from lecture: $S_1 = argmax_{s_1' \in S_1} \min_{s_2 \in S_2} u_1(s_1', s_2)$
- Given a strategy of 1: play Left with probability p and Right with $1-p$ ($0 \le p \le 1$):
  - If $p > 1/2$, $s_2 = Right$ leads 1 to earn $(-2)p + 2(1-p) < 0$;
  - If $p < 1/2$, $s_2 = Left$ leads 1 to earn $2p + (-2)(1-p) < 0$;
  - If $p = 1/2$, then regardless of 2's strategy 1 earns 0.
  - Thus $p = 1/2$ is the maxmin strategy.

Question 4

Minimax

Consider the matching-pennies game:

1\ 2	Left	Right
Left	2,-2	-2,2
Right	-2,2	2,-2

Apply the Minimax theorem presented in lecture 3-4 to find the payoff that any player must receive in any Nash Equilibrium:

Your Answer		Score	Explanation
d) 0.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

(d) is true.

- Since the previous game is a (finite) two-player, zero-sum game, by the theorem presented in the lecture we know that in any Nash equilibrium each player receives a payoff that is equal to both his maximin value and his minimax value.
- From the previous question we know that each player's maximin strategy is to play Left and Right with probability 1/2, which gives an expected payoff (maximin value) of 0.

Question 5

Correlated Equilibrium

1\ 2	B	F
B	2,1	0,0
F	0,0	1,2

Consider the following assignment device (for example a fair coin):

- With probability 1/2 it tells players 1 and 2 to play B, and with probability 1/2 it tells them to play F.
- Both players know that the device will follow this rule.

What is the expected payoff of each player when both players follow the recommendations made by the device? If one of players follows the recommendation, does the other player have an incentive to follow the recommendation as well?

Your Answer		Score	Explanation
c) Expected payoff $= 1.5$; player has an incentive to follow the recommendation.	✓	1.00	
Total		1.00 /	

1.00

Question Explanation

(c) is true.

- If both players follow the recommendation of the device, they will play (B, B) with probability $1/2$ and (F, F) with probability $1/2$. Then, the expected payoff is $1/2 * 2 + 1/2 * 1 = 1.5$.
- It is easy to check that if one of the players is following the recommendation, then the other player has an incentive to do the same:
  - Suppose that player 1 follows the recommendation of the device.
  - When player 2 is told to play B, he/she knows that player 1 was also told to play B (and that is the strategy that he/she will play).
  - Player's 2 best response to player 1 playing B is to also play B.
  - The same holds when player 2 is told to play F. Therefore, player 2 will follow what the device tells him/her to do.