Game Theory and Mechanism Design

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Practice Problems in Correlated Strategies

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Problem Set 5

Warm-up

1. Show that the inequalities in (25.1) on page 374 are equivalent to the inequalities (25.2) on Page 375.
2. Problem 5 on Page Page 378
3. Show that the payoff of any player under any correlated equilibrium is at least the maxmin value of that player.
4. Show in a matrix game that the row player's utility in any correlated equilibrium is equal to the value of the game in mixed strategies.

Workhorse

1. Show given any mixed strategy profile that we can always find a correlated strategy that produces the same expected payoff to each player as the mixed strategy profile.
2. Consider the following two player game:

	A	B
A	4,1	0,0
B	3,3	1,4

   For the above game, compute:

   (a) the space of all payoff allocations under mixed strategy profiles
   (b) the space of all payoff allocations under mixed strategy Nash equilibria
   (c) the space of all payoff allocations under correlated strategies
   (d) the space of all payoff allocations under individually rational correlated strategies
   (e) the space of all payoff allocations under correlated equilibria

Thought Provoking

1. Is it possible that a finite strategic form game may not have correlated equilibria?
2. Given a finite strategic form game, show that the following sets are closed and convex.
   (a) The space of all payoff allocations achievable under correlated strategies
   (b) The space of all payoff allocations achievable under individually rational correlated strategies
   (c) The space of all payoff allocations achievable under correlated equilibria
3. Given a correlated strategy, can we find a mixed strategy profile that produces the same expected payoff to each player as the correlated strategy. Justify your answer.
4. Given a mixed strategy Nash equilibrium of a strategic form game, define the following correlated strategy that assigns to each pure strategy profile the product of the probabilities of these pure strategies under the given MSNE. Show that this correlated strategy is a correlated equilibrium.