

Homework # 2: IESDS, Nash, and Subgame Perfect Equilibria

Due: February 25, 11:30 am

Do 4 out of the first 5 questions. You MUST do question 6 and 7.

1. **Iterated Elimination** In the following normal-form game, which strategy profiles survives each round of iterated elimination of strictly dominated strategies.

		Player 2		
		L	C	R
Player 1	U	6, 8	2, 6	8, 2
	M	8, 2	4, 4	9, 5
	D	8, 10	4, 6	6, 7

2. **Popsicle Stands:** Five lifeguard towers are lined up along a beach; the leftmost tower is number 1 and the rightmost tower is number 5. Two vendors, players 1 and 2, each have a popsicle stand that can be located next to one of five towers. There are 25 people located next to each tower, and each person will purchase a popsicle from the stand that is closest to him or her. That is, if player 1 locates his stand at tower 2 and player 2 at tower 3, then 50 people (at towers 1 and 2) will purchase from player 1, while 75 (from towers 3, 4, and 5) will purchase from vendor 2. Each purchase yields a profit of \$1.
 - (a) Specify the strategy set for each player.
 - (b) Are there any strictly dominated strategies?
 - (c) Find the set of strategies that survive rationalizability.
3. **Public Good Contribution:** Three players live in a town, and each can choose to contribute to fund a streetlamp. The value of having the streetlamp is 3 for each player, and the value of not having it is 0. The

mayor asks each player to contribute either 1 or nothing. If at least two players contribute then the lamp will be erected. If one player or no players contribute then the lamp will not be erected, in which case any person who contributed will not get his money back.

Using the payoff matrix from HW # 1, what outcomes can be supported as pure-strategy Nash equilibria?

4. **Discrete All-Pay Auction:** In Section 6.1.4 we introduced a version of an all-pay auction that worked as follows: Each bidder submits a bid. The highest bidder gets the good, but all bidders pay their bids. Consider an auction in which player 1 values the item at 3 while player 2 values the item at 5. Each player can bid either 0, 1, or 2. If player i bids more than player j then i wins the good and both pay. If both players bid the same amount then a coin is tossed to determine who gets the good, but again both pay
 - (a) Write down the game in matrix form.
 - (b) Which strategies survive IESDS?
 - (c) Find the Nash equilibria for this game
5. **The Dean's Dilemma** A student stole the DVD player from the student lounge. The dean of students (player 1) suspects the student (player 2) and begins collecting evidence. However, evidence collection is a random process, and concrete evidence will be available to the dean only with probability $\frac{1}{2}$. The student knows that the evidence-gathering process is under way but does not know whether the dean has collected evidence or not. The game proceeds as follows: The dean realizes whether or not he has evidence and can then choose his action, whether to accuse the student (A) or bounce the case (B) and forget it. Once accused, the student has two options: he can either confess (C) or deny (D). Payoffs are realized as follows: If the dean bounces the case then both players get 0. If the dean accuses the student and the student confesses, the dean gains 2 and the student loses 2. If the dean accuses the student and the student denies, then payoffs depend on the evidence: If the dean has no evidence then he loses face, which gives him a loss of 4, while the student gains glory, which gives him a payoff of 4. If, however, the dean has evidence then he is triumphant and gains 4, while the student is put on probation and loses 4.
 - (a) Draw the game tree that represents the extensive form of this game.

- (b) Write down the matrix that represents the normal form of the extensive form you drew in (a).
 - (c) Solve for the Nash equilibria of the game.
6. **A Grad Student's Dilemma:** A graduate student is teaching a First Year Seminar class. They have been given \$250 to support community within their class. Provide some possible actions in their action set. Describe how these actions might affect the students' payoffs.
7. **Reflection** How long did this assignment take you (be honest)? Do you feel that this is too short or long? How is the material going? How can I help you?