

Write all answers in your bluebook. Show all of your work. The exam ends at 10:55.

1. Consider the following situation. There are three people: Amy, Bart and Chris. Amy has two cards, a King and a Queen. Bart also has two cards, a King and a Queen. At the beginning of the game, Amy places one of her cards into an envelope and gives the envelope to Bart. Bart sees the card that Amy placed in the envelope, adds one of his cards to the envelope, and gives the envelope to Chris. Chris opens the envelope and sees the two cards inside. She does not know which card came from Amy and which came from Bart. After observing the contents of the envelope, Chris selects Y or N. If Chris selects Y and Amy put a King in the envelope, then Amy and Bart each get a payoff of 0 and Chris gets 1. If Chris selects N and Amy put a Queen in the envelope, then again, Amy and Bart each get a payoff of 0 and Chris gets 1. In all other outcomes, Amy and Bart each get a payoff of 1 and Chris gets 0.

(a) (8pts) Draw the game tree for this situation. Be sure to label who plays at each decision node and what action each branch represents. Clearly indicate information sets. Make your diagram large and draw it carefully.

(b) (2pts) Is this a game of perfect or imperfect information? Explain how you can tell.

(c) (5pts) List the strategies in S_B , the strategy set for Bart.

(d) (8pts) Write one strategy profile for this game.

(e) (2pts) Write the payoff profile associated with the strategy profile in part (d).

2. Consider a two-player simultaneous-move game in which $S_1 = \{A, B, C\}$ and $S_2 = \{D, F\}$. For each of the parts below, suppose that this game does **not** have a dominant strategy equilibrium. Consider each of the statements below independently. For each, indicate whether the statement is definitely true, is possibly true, or cannot be true. (2pts each)

(a) The game is a Prisoner's Dilemma.

(b) Player 1 has a dominant strategy.

(c) Players 1 and Player 2 both have dominated strategies.

(d) The game has six Pareto efficient outcomes.

(e) The game has at least one Pareto efficient outcome.

3. For parts (a) and (b), consider a two-player game with $S_1 = \{T, M, B\}$ and $S_2 = \{L, C, R\}$.

(a) (5pts) Fill in the blanks in the mathematical expressions below. That is, recopy the expressions into your bluebook, filling in the blanks.

If strategy C is dominated by R, then

$$U_2(T, \quad) <$$

$$U_2(M, \quad) <$$

$$U_2(B, \quad) <$$

(b) (5pts) Fill in the blanks in the mathematical expressions below. That is, recopy the expressions into your bluebook, filling in the blanks.

If T is a dominant strategy, then

$$U_1(T, \quad) >$$

$$U_1(T, \quad) >$$

$$U_1(T, \quad) >$$

$$U_1(T, \quad) >$$

$$U_1(T, \quad) >$$

$$U_1(T, \quad) >$$

4. For parts (a)-(g), Consider Game 1.

		Game 1		
		Player 2		
		L	M	R
Player 1	T	6, 12	5, 4	1, 2
	I	4, 3	2, 3	1, 4
	B	4, 8	6, 5	1, 2

(a) (5pts) In words, explain what $\theta_1(I)$ means.

(b) (10pts) Consider $\sigma_1 = (1/2, 0, 1/2)$ and $\sigma_2 = (1/2, 0, 1/2)$. Find $U_1(\sigma_1, \sigma_2)$.

(c) (10pts) Suppose $\theta_1 = (3/4, 0, 1/4)$. Find $U_2(\theta_1, M)$.

(d) (10pts) Suppose $\theta_1 = (3/4, 0, 1/4)$. What is $BR_2(\theta_1)$?

(e) (10pts) List all **dominated** strategies in Game 1. For each dominated strategy, list a strategy that dominates it.

(f) (5pts) Is there a dominant strategy equilibrium? If so, what is it?

(g) (5pt) List all the Pareto efficient payoff profiles of the game.