

# EconS 503 - Microeconomic Theory II

## Homework #2 - Due date: February 15th.

1. **A strategy that is never a best response, yet is not a dominated strategy.** Consider the following simultaneous-move game between player 1 (in rows) and player 2 (in columns).

		Player 2	
		<i>L</i>	<i>R</i>
Player 1	<i>U</i>	4, 2	0, 1
	<i>C</i>	0, 2	4, 1
	<i>D</i>	1, 0	1, 3

- (a) Show that strategy *D* is never a best response for player 1.
- (b) Show that strategy *D* is not strictly dominated by *U* or *C*.
2. **Mixed strategy NE in a patent race.** Consider two firms simultaneously choosing an investment level in R&D,  $x_i \in \{0, 1, \dots, k\}$  for every firm  $i = \{1, 2\}$  where  $k > 2$ . Assume that every firm  $i$ 's profit function is

$$\pi_i(x_i, x_j) = \begin{cases} R_i - x_i & \text{if } x_i > x_j, \text{ and} \\ -x_i & \text{otherwise} \end{cases}$$

That is, firm  $i$  obtains a revenue of  $R_i$  if it invests more than firm  $j$  ( $x_i > x_j$ , which means that this firm wins the patent race. Revenue  $R_i$  satisfies  $R_i > k$ , entailing a positive profit for all admissible values of  $x_i$ . In contrast, if firm  $i$  invests the same or less than firm  $j$ ,  $x_i \leq x_j$ , firm  $i$  loses the patent race and obtains no revenue from its R&D investment.

- (a) Show that the game has no pure strategy NE.
- (b) Find a mixed strategy NE for every firm  $i$ .
3. **Exercises from Tadelis:**
- (a) Chapter 5: Exercises 5.5, 5.11, 5.16, and 5.17.
- (b) Chapter 6: Exercises 6.3, 6.5, 6.7, and 6.11.