

Intermediate Microeconomics

Fall 2025 - M. Chen, M. Pak, and B. Xu

Problem Set 6: due the week of Dec. 29.

1. Consider the following two player game:

		player 2			
		<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
player 1	<i>A</i>	3, 6	4, 7	2, 5	0, 6
	<i>B</i>	7, 2	5, 3	3, 0	3, 2
	<i>C</i>	4, 3	4, 2	2, 1	1, 6

- Does any player have a strictly dominant strategy? Find the strictly dominant strategies solution, if any.
- Find the iterated elimination of strictly dominated strategies solution, if any.
- Find all the Nash equilibria, if any.

2. One of the results discussed in the lecture is:

Theorem: Suppose strategy s'_i (in a finite game) is strictly dominated by strategy $\hat{s}_i$ when opponents are restricted to using pure strategies. That is,

$$\pi_i(\hat{s}_i, s_{-i}) > \pi_i(s'_i, s_{-i}) \quad \forall s_{-i} \in S_{-i}.$$

Then strategy s'_i will never be in the support of a best response. That is, for all σ_{-i} ,

$$\sigma_i \in BR_i(\sigma_{-i}) \implies \sigma_i(s'_i) = 0.$$

□

- Use this result to find all the Nash equilibria (including mixed strategy ones) of the following game.

		player 2	
		<i>L</i>	<i>R</i>
player 1	<i>T</i>	10, 5	4, 1
	<i>M</i>	6, 1	8, 8
	<i>B</i>	5, 0	0, 10

- (b) The above theorem holds even when s_i is strictly dominated by a mixed strategy. That is, when there is some $\hat{\sigma}_i$ such that

$$\pi_i(\hat{\sigma}_i, s_{-i}) > \pi_i(s'_i, s_{-i}) \quad \forall s_{-i} \in S_{-i}.$$

Use this result to find all the Nash equilibria (including mixed strategy ones) of the following game.

		player 2	
		L	R
player 1	T	8, 1	0, 0
	M	4, 0	12, 2
	B	6, 0	5, 10

3. Consider the following model of Cournot competition with differentiated goods. Two firms compete by setting quantities. They have the identical cost function $c_i(q_i) = cq_i$. However, they face different (inverse) demand:

$$p_i(q_i, q_j) = (a - bq_i - dq_j), \quad \text{where } a > c \text{ and } i \neq j.$$

- Find the firms' best response functions.
 - Find the Nash equilibrium output levels.
 - Suppose the government imposes a license fee so that any firm operating in this market (that is, produces a positive amount output) must pay a fixed (lump-sum) license fee F . Suppose $a = 100$, $b = 1$, $d = 2$, and $c = 1$. If $F = 10$, how does this affect the Nash equilibrium output levels of the firms? How about the profits of the firms?
 - Is there a level of license fee at which one of the firms will drop out of the market?
4. Consider the following variation on Cournot Oligopoly model. There are three identical firms. Firm i 's cost function is $c(q_i) = q_i$, and the inverse market demand function is given by $P = 7 - (q_1 + q_2 + q_3)$. Suppose that instead of making the output decisions simultaneously, firm 1 decides before the other firms. That is, assume that firm 1 sets its output quantity first. Then firm 2 and firm 3, after observing firm 1's quantity, simultaneously set their output quantities.
- Find a Nash equilibrium of the subgame that starts after firm 1 makes its output decision.
 - Find a subgame perfect Nash equilibrium of the entire game.