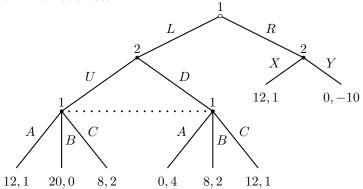# Microeconomic Theory II   Spring 2023
Midterm Exam   Mikhael Shor

Question 1. Consider the normal form game below.

Player 2

	A	B	C	D
M	9, 1	7, 0	7, 2	7, 4
N	7, 1	5, 3	1, 2	9, 1
O	9, 2	9, 0	9, 4	7, 2
P	3, 3	1, 2	1, 2	8, 3

Player 1 (rows M, N, O, P)

(a) What strategies survive the iterated deletion of strictly dominated strategies? Carefully explain each step.

(b) Are any Nash equilibria of this game *not* trembling-hand perfect? Explain.

(c) What strategies are weakly dominated?

Question 2. Consider the extensive form game below. The dotted line represents an information set.

(a) List all subgame-perfect Nash equilibria.

(b) Does this game have a Nash equilibrium that is not subgame-perfect? Briefly explain.

Question 3. When a pharmaceutical drug maker advertises a new drug, the advertising can have positive spillover effects for competitors. Consider an industry consisting of two symmetric firms, 1 and 2, who are Cournot duopolists. Inverse demand is given by $P = A - q_1 - q_2$, where A is the amount of advertising and q_1 and q_2 are the firms' quantity choices.

Consider the following two-period game:

In the first period, firm 1 decides how much to invest in advertising, $A \geq 0$. The cost of advertising A is $\frac{2A^3}{81}$.

In the second period, firms observe A and the resulting inverse demand given by $P = A - q_1 - q_2$, and simultaneously select quantities, q_1 and q_2. There are no marginal costs. Second-period profits for firm i are given by Pq_i.

1. Describe the set of strategies for each player.

2. Find the subgame-perfect Nash equilibrium.

   Now imagine that instead of firm 1 selecting and paying for A, the firms form an advertising cooperative. Effectively, in the first period, the firms agree on a level of A that and share the cost of $\frac{2A^3}{81}$ equally between them. In the second period, as before, the firms simultaneously select quantities, q_1 and q_2.

3. What is the level of advertising, A, in the subgame-perfect Nash equilibrium?