Microeconomic Theory II — Spring 2021

Final Exam — Mikhael Shor

Carefully explain and support your answers.

Question 1. Consider a standard two-player two-type signaling game. The sender is one of two types, t_1 or t_2, with the prior probability of t_1 given by $p > \frac{1}{2}$. The sender selects a message m_1 or m_2 and the receiver (who observes the message but not the type) selects an action a_1 or a_2.

The payoffs of the sender and receiver as a function of type, message, and, action are given by:

When sender is t_1

	a_1	a_2
m_1	$50, 1$	$-10, 0$
m_2	$0, 1$	$-10, 0$

When sender is t_2

	a_1	a_2
m_1	$50, 0$	$-10, 1$
m_2	$0, 0$	$-10, 1$

1. Draw the extensive form of the game.
2. Carefully write down all pure-strategy weak perfect Bayesian equilibria (and demonstrate that these are *all* of the pure-strategy equilibria).
3. For each of the above equilibria, explain whether it satisfies the intuitive criterion.

Question 2. Consider a regular principal-agent model. The agent can choose between two effort levels, $e \in \{L, H\}$ with associated costs of $c \in \{0, 2\}$. Each effort level generates one of four profits $\pi \in \{\pi_1, \pi_2, \pi_3, \pi_4\}$ with associated probabilities of $\{.2, .2, .4, .2\}$ for $e = L$ and $\{.1, .1, .2, .6\}$ for $e = H$.

The principal is risk neutral with utility function given by $\pi - w$, where w is the wage paid to the agent.

The agent's utility function is given by:

$$\ln w - c$$

The principal observes π but not e.

1. Solve for the optimal incentive contract that induces low effort, $e = L$.
2. Solve for the optimal incentive contract that induces high effort, $e = H$.

Question 3. Consider a two-firm differentiated Cournot market in which the profit of each firm ($i \neq j$) is given by:

$$p_i(q_i, q_j)q_i - c_i q_i = (1 - q_i - \beta_i q_j - c_i)q_i$$

where c_i is the firm's marginal cost and β measures how similar consumers view the a firm's offerings to the offerings of its rival.

Each firm has a budget that can be used *either* to reduce its costs of production *or* to differentiate its product, but not both.

A firm $i \neq j$ that has reduced its cost of production will have $c_i = 0$ but $\beta_i = 1$, with profits of $(1 - q_i - q_j)q_i$

A firm $i \neq j$ that has differentiated its product will have $\beta_i = 0$ but positive marginal costs with profits of $(1 - q_i - c_i)q_i$

The timing of the game is in two stages. In the first stage, both firms simultaneously decide on their investment, either to reduce costs or to differentiate its product. In the second stage, after observing first-stage decisions, both firms simultaneously decide on q_i.

Assume that $c_i = \frac{1}{4}$. Carefully derive *all* pure-strategy subgame-perfect Nash equilibria.