Part I: Multiple-choice questions. Select exactly one alternative for each question. Each correct answer gives 5 points and each incorrect answer -1 point.

1. A monopoly with a constant marginal cost of 2 is facing the demand function $Q(p) = 12 - 2p$. What is the *Lerner Index* at the profit-maximizing price $p_m = 4$?

   (a) 1.
   (b) 1/2.
   (c) 1/3.
   (d) 1/4.
   (e) None of the above.

2. The candy store Candice is selling two types of chocolate bars, Dark (D) and Milk (M), to a market consisting of two types of consumers in equal shares: A and B. The reservation price for each bar is given in Figure 1 below. Candice purchases each bar at a cost of 1. What are the profit-maximizing prices for a Dark bar, p_D, a Milk bar, p_M, and a bundle with one unit of each, p_{DM}, assuming *mixed bundling* and that consumers buy if they are indifferent between consuming or not?

   (a) $p_D = 2, p_M = 2, p_{DM} = 7$.
   (b) $p_D = 5, p_M = 2, p_{DM} = 12$.
   (c) $p_D = 5, p_M > 10, p_{DM} = 12$.
   (d) $p_D = 5, p_M = 10, p_{DM} = 7$.
   (e) None of the above.

	A	**B**
Dark	5	2
Milk	2	10

Fig. 1

3. Consider the following extensive form game. Firm 1 first chooses whether to adopt one of two technologies, L or R. Without observing firm 1's choice, firm 2 thereafter chooses whether to adopt technology l or r. The game is depicted in Fig. 3 (with firm 1's payoff to the left). Which of the following statements is true?

   (a) The game can be solved using backward induction.

   (b) The game has a unique subgame-perfect equilibrium.

   (c) The game has a unique Nash equilibrium.

   (d) The game is dominance solvable.

   (e) None of the above.

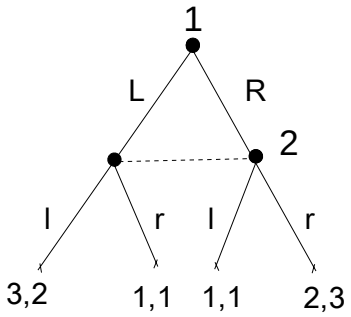

Fig. 3.

4. Suppose the game in Fig. 2 is repeated infinitely and that the players have common discount factor ρ, where $0 < \rho < 1$. (The row player's payoff is to the left in each cell.) Suppose further that each player uses the following strategy: i) start playing A, ii) continue playing A as long as noone has played B, iii) play B forever after if someone has played B. Under what condition is this a *subgame-perfect equilibrium*?

   (a) $\rho \leq 1/3$.

   (b) $\rho \geq 1/3$.

   (c) $\rho \leq 2/3$.

   (d) $\rho \geq 2/3$.

   (e) None of the above.

	A	B
A	$2,1$	$-1,3$
B	$3,-1$	$0,0$

Fig. 2.

5. What is meant by the *efficiency effect* of innovation?

   (a) Efficient, innovative firms are more likely to survive in the long run.

   (b) A monopolist undervalues innovation since its output is suboptimal from a welfare perspective.

   (c) A firm that has already made a sunk technology investment is less likely to adopt a new technology than one that has not.

   (d) For a monopoly, replacing oneself is better than being replaced by a newcomer.

   (e) None of the above.

6. All firms in a competitive market have a constant marginal cost of 30. One of them innovates and lowers its marginal cost to $c \geq 0$. If the market demand function is given by $Q(p) = 50 - p$, then for what range of c is the innovation *drastic*?

   (a) $c < 5$.

   (b) $c < 10$.

   (c) $c < 15$.

   (d) $c < 20$.

   (e) None of the above.

Part II: Questions that require answers with calculations/motivation.

7. The monopoly firm Obit is selling a good to two types of customers, high income (H) and low income (L). The individual demand functions for each type of customer are given by $Q_H(p) = 60 - 3p$ and $Q_L(p) = 60 - 6p$ and Obit has a constant marginal cost of 4.

   (a) (10 points) Suppose Obit practices *third-degree price discrimination*. What are the optimal prices, p_H and p_L, for the two types of customers?

   (b) (10 points) Suppose Obit practices *second-degree price discrimination* using a two-part tariff, (T, p). What is the optimal two-part tariff assuming the fraction of H-types is $1/3$ and the fraction of L-types $2/3$?

   (c) (10 points) Suppose Obit can practice *first-degree price discrimination* using block-pricing. What are the optimal quantities of each block, q_H and q_L?

8. Alfa (A) and Beta (B) are competing à la Cournot in the market for dogfood. They have identical cost functions, $C(q_A) = q_A^2/2$ and $C(q_B) = q_B^2/2$. The inverse demand function for dogfood is given by $P(Q) = 12 - Q$, where $Q = q_A + q_B$ is total demand.

   (a) (10 points) What is *Beta's best-response function*?

   (b) (10 points) What are the *Nash-equilibrium* quantities?

   (c) (10 points) Change the setting so that Alfa sets its quantity before Beta, and Beta can observe Alfa's quantity when making its output choice. What is the quantity produced by Alfa in a *subgame-perfect equilibrium*?

Part III: Credit question that requires an answer with calculations/motivation (only for students who do not have credit for the assignments).

9. (10 points) Suppose a monopoly firm can open stores in a linear city of length 1 km. A total of 1000 consumers are uniformly distributed on the line and each of them has a reservation price of 10 for one unit of the good, and a transportation cost of 1 per km. All stores charge an identical uniform price and the consumers buy from the store that is closest if this gives them a nonnegative consumer surplus, $10 - p - x$, where x is the distance to the store in km. Stores have zero variable cost but opening a store implies a sunk fixed cost of 5. Assuming that the stores are located in a profit-maximizing fashion, and that the firm prefers to serve the entire market, how many stores should the firm open?