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. Three identical firms are competing à la Cournot in a market. In equilibrium, the *Lerner Index* for each firm is given by 1/6. What is the price elasticity of industry demand?

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

2. Which of the following statements regarding *3rd-degree price discrimination* (3DPD) by a monopolist is true?

   (a) 3DPD is more efficient than uniform pricing.
   (b) 3DPD is less efficient than uniform pricing if output is the same under the two.
   (c) More clients are served under uniform pricing than 3DPD.
   (d) Profits are at least as high with uniform pricing as 3DPD.
   (e) None of the above.

3. Candice wants to sell two kinds of chocolate bars, Dark and White, to three consumers: A, B, and C. The reservation price for each bar is given in Figure 1 below. Candice purchases each bar at a cost of 1. What are the maximum profits Candice can achieve by practicing *mixed bundling,* assuming the consumers buy if they are indifferent between consuming or not?

   (a) 10.
   (b) 9.
   (c) 8.
   (d) 6.
   (e) None of the above.

	A	**B**	**C**
Dark	1	4	3
White	4	1	3

Fig. 1

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4. Consider the following extensive form game. Player 1 first chooses between L and R. If she chooses R, she thereafter gets to choose between l and r. Without observing player 1's choice, player 2 thereafter chooses between T and B. The game is depicted in Figure 2 (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.
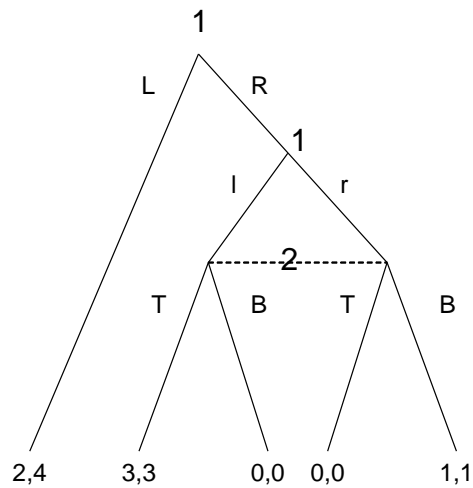   (d) Player 2 has four strategies.
   (e) None of the above.

Fig. 2.

5. Suppose the game in Figure 3 is repeated infinitely and that the row player has discount factor ρ and the column player has discount factor 0.4. (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 no one has played B, iii) play B forever after if someone has played B. Under what condition is this a Nash equilibrium?

   (a) $\rho \leq 0.5$.

   (b) $\rho \geq 0.5$.

   (c) $\rho \leq 0.4$.

   (d) $\rho \geq 0.4$.

   (e) None of the above.

	A	B
A	$3,3$	$-1,6$
B	$6,-1$	$0,0$

Fig. 3.

6. Which of the following statement regarding a good with positive network externalities is *not true*?

   (a) The consumer valuation of such a good is increasing in the number of other users.

   (b) An entrant to a market with an incumbent firm selling the good has a second-mover advantage.

   (c) Penetration pricing can be used to reach a critical mass of consumers.

   (d) The market for the good may have multiple equilibria.

   (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 in equal shares, high income (H) and low income (L). The individual demand functions for each type of customer are given by $Q_H(p) = 10 - p$ and $Q_L(p) = 8 - p$ and Obit has a constant marginal cost of 1.

   (a) (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?

   (b) (10 points) Suppose Obit practices *second-degree price discrimination* using a two-part tariff, (F, p). What is the optimal two-part tariff?

   (c) (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?

8. The market for *cronuts* has inverse demand function $P(Q) = 30 - Q/2$. Two firms, D and E, have the skills to produce cronuts.

   (a) (10 points) Suppose that D and E are identical, and that both have a unit cost of 10. Compute the Nash equilibrium quantities, $q_D + q_E = Q$, if the two firms are are competing à la Cournot.

   (b) (10 points) Suppose only D has access to a costly innovation that will lower its unit cost to 8. What are the Nash equilibrium quantities if D invests in the innovation (i.e. assuming that D has a unit cost of 8 and E a unit cost of 10)?

   (c) (10 points) Without performing any calculations, explain if D would be willing to pay more or less for the innovation than in (b) if E initially had a unit cost above 30. What is the name of the corresponding effect?

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 is selling access to a network for a price of p. The marginal cost of giving a consumer access to the network is 0. Consumers' valuation of the access are given by $\tilde{v} f^k$, where f is the fraction of consumers served, $\tilde{v}$ is distributed uniformly between 0 and 1 across consumers, and $k \geq 0$ is a constant that determines the degree of network effects. What is the price p that maximizes total profits?