Name:

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All questions must be answered on this test form!
For each question you must show your work and (or) provide a clear argument.
Use the last two pages and the back of the form as scratch paper.

Question 1 A firm hires two kinds of workers, A and B. A type A worker produces 60,000 Dollars of output, while a type B worker produces 40,000 Dollars. Before they are hired, only the workers know their type (the firm is uninformed). In order to be able to distinguish the type of workers, the firm wants to offer a test. Type A workers always pass the test, while type B workers only pass it with probability α. The firm charges x Dollars for taking the test. Employees who pass the test, receive a wage of 50,000 Dollars, whereas employees who fail the test receive a wage of 35,000 Dollars. Workers can choose whether or not to take the test.

(a) Suppose that $\alpha = 0.1$ and $x = 2,000$. Then (circle the correct answer) *3 points*

Both types take the test | **Only type *A* workers take the test**

Only type *B* workers take the test | **Nobody takes the test**

(b) Now let α be arbitrary (i.e., α is no longer 0.1). Determine the lowest value of x at which a separating equilibrium exists (i.e., where one of the types chooses to take the test, while the other does not). Note that x depends on α. *6 points*

***x* =** .

Question 2 A firm hires a person, the agent, to do a project which results either in a value of 200 Dollars or 500 Dollars to the firm. The person can choose either high or low effort, i.e., $e \in \{e_l, e_h\}$. If the low effort is chosen, then the high realization, 500, occurs with probability 0.1; if the person's effort is high, then the high realization occurs with probability is 0.5. Unfortunately, the firm cannot observe the person's effort. As a consequence, payments to the agent can only depend on the project realization. Denote by $w_l \geq 0$ and $w_h \geq 0$ be the payment to the agent when the realization is low (200 Dollars) or high (500 Dollars), respectively. The agent's utility function is given by $p_l w_l + p_h w_h - \phi(e)$, where $\phi(e_l) = 20$, $\phi(e_2) = 50$, and p_l and p_h denote the probabilities of the low and high realization respectively. The agent is willing to work for the firm if his utility is at least 0. The firm wants to maximize its expected payoff $0.5(200 - w_l) + 0.5(500 - w_h)$, which can only be done if the agent choose e_h. To induce the agent to choose the high effort level, the agent's payoff from high effort $0.5w_l + 0.5w_h - \phi(e_h)$ must be at least as high as that from choosing the low effort, $0.9w_l + 0.1w_h - \phi(e_l)$. *10 points*

The firm's maximum expected payoff is .

The maximum payoff can be obtained by choosing (*the answer to this question is not unique*)

$w_l =$, $w_h =$.

(*Note:* You can solve this question without using the Lagrangean. Realize that the payments w_l and w_h must implicitly "reward" the agent for choosing the high effort level and "punish" him for choosing the low one.)

Question 3 Suppose that person *A* wants to sell a painting to person *B*. This painting can be either genuine or a forgery, but only the seller, i.e., person *A* has that information. Absent any additional information, person *B* believes that there is a 50% probability that the painting is a forgery. The valuations of the two parties are as follows:

- The painting is genuine: *A* is willing to sell for at least 8,000 while *B* is willing to buy for at most 9,000.
- The painting is a forgery: *A* is willing to sell for at least 200 while *B* is willing to buy for at most 300.

(a) In equilibrium (*circle the correct answer*) **Both types of paintings** **only genuine paintings** **only forgerys** **no painting** will be sold. *3 points*

In case paintings are sold in equilibrium, the price will be between **Dollars** and **Dollars**. *Leave blank if no paintings are sold* *3 points*

(b) Now suppose that at a cost of 500 Dollars the seller can credibly disclose the information whether or not the painting is a forgery. Then information will be disclosed by (*circle the correct answer*) **only sellers of a genuine painting** **only sellers of a forgery** **seller of both types of paintings** **no seller**.

In case forgerys are sold in equilibrium, the price will be between **Dollars** and **Dollars**. *Leave blank if no forgerys are sold*

In case genuine paintings are sold in equilibrium, the price will be between **Dollars** and **Dollars**. *Leave blank if no genuine paintings are sold*

(c) Suppose the government introduces a law that mandates information disclosure to the buyer whenever a painting is sold. Explain in the box below how this law affects (a) the trade of forgerys or genuine paintings (b) efficiency. *3 points*

Question 4 Suppose that a cost function is $C(Q) = 20 + 8Q^2$. Then *10 points*

Fixed costs are

Marginal costs are

Average fixed costs are

Average variable costs are

Average total costs are

Question 5 If free entry is possible in a competitive market and all firms have the same production costs, then equilibrium profits must be zero.

Suppose each firm has a cost function $C(Q) = 72 + 2Q^2$. Then for profits to be zero, the equilibrium price P^* must be equal to average total costs. In addition, the usual condition for profit maximization for a competitive firm must hold. Using these two conditions, you can conclude that *10 points*

The equilibrium price is P^* =

Each firm produces Q^* = units of output.

Question 6

(a) Suppose there are currently two types of firms in a competitive market. Firms of type A have a cost function of $C(Q) = 500 + 0.5Q^2$, while firms of type B have a cost function $C(Q) = 200 + 0.25Q^2$. Suppose there are 200 firms of each type. Demand is $Q_D(P) = 20,000 - 400P$. Then *7 points*

The supply of an individual type A firm $Q_A(P)$ =

The supply of an individual type B firm $Q_B(P)$ =

Total industry supply is $Q_S(P)$ =

The equilibrium price is P^* =

Each type B firm's profit is

(b) You can check that type A firm's profit is negative. Suppose that as a consequence type A firms exit the market. Then *4 points*

The new equilibrium price is P^* =

Each type B firm's profit is

Question 7 Suppose that in countries A and B, production is described by the same Cobb-Douglas technology $f(K, L) = K^{0.6}L^{0.4}$. Suppose that the price of a unit of capital is $r = 2$ in both countries. Both countries employ the same amount of labor, i.e., $L_A = L_B$, but the wage in country B is five times higher than in country B, i.e., $w_A = 10$ and $w_B = 2$. Let K_A and K_B denote the amount of capital in both countries and suppose that $K_A = 400$. Then *10 points*

$K_B =$

Question 8

(a) Suppose that *AA* is the only one airline that offers service between Champaign and Chicago. The demand for tickets is given by $Q(P) = 800 - 2P$. Suppose the cost function is $C(Q) = 50,000 + 40Q$. Then, the profit maximizing price is *5 points*

$P^* =$, and profit is

(b) Now assume that a competitor, *UA*, considers whether to enter the market. *UA*'s cost function is also $C(Q) = 50,000 + 40Q$. What would UA's profit be if it entered the market?

In order to find the answer, note that in equilibrium, $MC = P(1 + \frac{s_i}{\epsilon_p})$ where s_i is the market share of competitor i, which will be 50% since both firms have the same cost function. Further, P is the price that both firms charge, but each firm only receives half the demand. For example, if the price were $P = 200$ then total demand is 400, but since each firm has 50% of the market share, they would each sell 200 tickets.

If *UA* entered then *6 points*

P^* = , and *UA*'s profit is

As a consequence, *UA* will (*circle the correct answer*)

enter the market **stay out of the market**.

Question 9 A firm has a cost function $C(Q) = 2Q$. The demand of a typical consumer is $Q(P) = 80 - 10P$. Suppose the firm uses the optimal (i.e., profit maximizing) two-part pricing schedule, consisting of a fixed fee F and a price per unit, P. Then *5 points*

$F =$, $P =$.

The firm's profit (per consumer) is .

If, instead, the firm charges a price per unit P' that maximizes profit (and does not do two-part pricing) then *5 points*

$P' =$, and the firm's profit is .

Question 10 Firm *A* is currently offering long-distance calling for 10cents per minute. Firm *B* wants to enter the market, but they decide to offer a calling plan with unlimited calls for a fixed fee *F*. Their calling plan is supposed to be targeted for high costumers, who according to firm *B*'s research, have a demand function $Q(P) = 200 - 400P$. Determine the profit maximizing fee *F* (assuming that firm *A* does not change its pricing schedule). *10 points*

***F* =** .

Not graded: Use as Scratch Paper

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