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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 pages and the back of the form as scratch paper.

Question 1 A person owns a car that will be stolen with probability 0.1 if an anti-theft device is not used, and with probability 0.05 if the device is used. The value of the car is 10,000 Dollars. The person's wealth, including the value of the car, is 12,000. The cost of the anti-theft device is \$10. Bernoulli utility is $\ln x$.

- (a) Suppose the insurance company cannot tell whether the person has purchased the anti-theft device. Then the insurance company will break even if

4 points

the premium is \$ _____ .

The person will buy not buy (Mark the correct answer) the anti-theft device.

The person's (expected) utility is _____ (three digits).

- (b) Now suppose that the government determines that all cars must have an anti-theft device installed. Suppose that the insurance company again offers full coverages at a rate at which it breaks even. The person must pay the 10 Dollars for the device. Then

4 points

The person's (expected) utility is _____ (three digits).

Hence, the government's policy improves reduces (Mark the correct answer) welfare.

(c) (a) and (b) illustrate an instance of a “moral hazard” problem. In the boxes below, briefly list two examples of moral hazard problems that may arise with health insurance. You can also indicate, whether or not you believe they are important.

4 points

Example 1:

Example 2:

Question 2 A company wants to offer car insurance. There are two types of drivers: good drivers and bad drivers. Good drivers have a probability of $2/1000$ of an accident, whereas bad drivers have an accident probability of $6/1000$. The company does not know the type. Assume that if an accident occurs, the damage is 25,600. The percentage of good drivers and bad drivers in the population is the same. Assume that both good drivers and bad drivers have an income of 40,000 if they do not have an accident. Their von Neumann Morgenstern utility function is $u(c_A, c_{NA}) = p\sqrt{c_A} + (1 - p)\sqrt{c_{NA}}$, where c_A is the consumption if an accident occurs, and c_{NA} is the consumption if there is no accident. p is the probability of an accident (which depends on the type of driver).

12 points

Assume the company offers two policies: (A) full insurance at a price of 160 Dollars. (B) Paying damages up to 15,000 Dollars at a price of 35 Dollars.

Good and bad drivers get the same expected utility from A.

The expected utility from insurance A is .

The expected utility of an uninsured good driver is .

The expected utility of an uninsured bad driver is .

The expected utility of a good driver with insurance B is .

The expected utility of a bad driver with insurance B is .

A good driver will therefore choose

insurance A

insurance B

no insurance

(mark the correct answer).

A bad driver will therefore choose

insurance A

insurance B

no insurance

(mark the correct answer).

Question 3 A firm's cost function is given by $c(Q) = 100 + Q^2$. Thus,

10 points

$MC(Q) =$ _____, $AC(Q) =$ _____.

Average costs are minimized at $Q =$ _____.

Average costs are increasing for $Q \geq$ _____.

Question 4 A firm's production function is given by $f(K, L) = K^2L$. The price of a unit of capital is $r = 2$ and the price of a unit of labor is $w = 1$. The firm wants to produce $Q = 125$ units of output at the lowest possible costs. Thus, the firm will choose

10 points

$K =$ _____, $L =$ _____.

The firm's costs are _____.

Question 5 Suppose there are currently 120 firms in a competitive industry, 80 of them are located in the U.S. and 40 are foreign. The domestic firms have cost functions $C(Q) = 10 + 4Q^2$. The foreign firms have cost functions $C(Q) = 10 + Q^2$. For simplicity, assume that the foreign firms only produce for the U.S. market. Suppose that demand in the U.S. is given by $Q_D(P) = 600 - 30P$.

7 points

(a)

In the market equilibrium, $P =$.

Each domestic firms produces $Q =$.

Each foreign firm produces $Q =$.

Total supply is $Q =$.

The profit of a domestic firms is .

The profit of a foreign firms is .

- (b) Now suppose that the domestic firms exit the market (because their profits are negative) leaving only the foreign firms. Then, in the market equilibrium,

4 points

$P =$ _____, and total supply is $Q =$ _____.

- (c) Determine the net-change in consumer surplus when comparing (a) to (b) (first, compute the net-surplus in (a) — gross surplus of consuming Q units, where Q is total supply, minus payments to firms. Then do the same for (b). Finally, take the difference between (b) and (a)). 6 points

If you were unable to find answers to (a) and (b), assume that $Q = 400$ in (a), $Q = 300$ in (b). Given these numbers you can get prices and the supply and profits of individual firms.

The change in surplus is .

(Note: the answer should be a negative number, because prices are higher in (b)).

Suppose the U.S. government pays to each domestic firms just enough money to cover losses so that the domestic firm remain in the market. Then (to consumers and firms in the U.S.)

the net-benefit of this policy is .

In contrast, if we adopt global perspective and take the effect on foreign firms into account, then

the net-benefit of this policy is .

Question 6

- (a) A monopolist has a cost function $c(Q) = 10,000 + 10Q$. Demand for the firm's product is given by $Q(P) = 1,000 - 10P$ (there are 100 consumers, each with the demand function $Q(P) = 10 - 0.1P$). The firm wants to charge a price per unit that maximizes profit.

8 points

The profit maximizing price is $P =$.

The firm's profit is .

- (b) Now suppose that the firm can do part pricing, i.e., charge a fixed fee F and a price per unit P . Then, the profit maximizing P and F are.

8 points

$F =$, $P =$.

The firm's profit is .

Question 7 There are two types of air travelers, A and B . Type A travelers value the “quality” of the travel experience more than type B travelers. Let Q denote “quality,” then A ’s demand function is $Q = 100 - 2p$ and B ’s demand function is $Q = 100 - 5p$. That is, if the airline would charge a price of p per unit of Q , then the above demand functions determine the quality level of service a customer will choose. However, rather than charging such a price p , the airline selects two quality levels Q_A (business class) and Q_B (economy) and charges ticket fees F_A and F_B such that type B customers are just willing to purchase a ticket with quality Q_B (i.e., after paying the fee F_B their net consumer surplus is 0) and such that type A customers will not choose coach tickets.

12 points

Assume that the airline decides to offer a coach service of quality $Q_B = 10$ and a business class service of quality $Q_A = 50$. Then if the airline chooses the ticket fees optimally,

12 points

An economy class ticket will cost

A business class ticket will cost

Question 8 A toy manufacture must decide in March 2006 how many units Q of a particular toy to produce for the holidays. Costs are $C(Q) = 7Q$. However, in March 2006 there is uncertainty about demand. In particular, demand may be either high $Q_h(P) = 100 - P$ or low $Q_l(P) = 80 - 2P$ with probability 0.5 each. In October 2006 the product is finished and ready to be shipped to retail stores. At this time demand is known and the firm must determine a price P .

First determine the price charged in October, given Q . At this time the firm's initial investment is sunk, and therefore revenue is maximized, subject to the firm not being able to sell more than Q units, i.e., the firm solves $\max_P Q_i(P)P$ s.t. $Q_i(P) \leq Q$, where Q_i either stands for Q_h or for Q_l . For each state you get two cases, depending on whether the constraint is slack or not (if the constraint is slack, then not all units are sold, i.e., the firm is left with excess inventory).

6 points

In state h (write the revenue as a function of Q —in one of the cases the revenue is a constant):

The firm's revenue is _____ if $Q \leq$ _____ .

The firm's revenue is _____ if $Q \geq$ _____ .

In state l (again, write the revenue as a function of Q):

The firm's revenue is _____ if $Q \leq$ _____ .

The firm's revenue is _____ if $Q \geq$ _____ .

Given Q , you can now compute the firm's expected revenue (0.5 times revenue in the high state plus 0.5 times revenue in the low state). This should give you 3 possible cases, depending on the level of Q (i.e, an expected revenue function for $Q \leq Q_1$, a second one for $Q_1 \leq Q \leq Q_2$ and a third one for $Q \geq Q_2$ where $Q_1 < Q_2$ are given by the cutoffs you determined above). For each of these cases deduct production costs. Now you can find the profit maximizing Q . If the maximizing Q satisfied the appropriate restriction for Q , then you found the overall solution (e.g., if you take the expression for $Q \leq Q_1$ and the optimal Q is indeed less or equal to Q_2).

5 points

The firm will produce $Q =$.

Prices in the high and low demand state, respectively are given by

$P_h =$, $P_l =$.

If state l is realized, the firm may have more inventory Q than it sells.

Excess inventory in the low state is .

(Enter "0" if there is no excess inventory).

Useful Formulæ

1. CAPM:

$$r_i = r_f + \beta_i(r_m - r_f).$$

2. Cost Minimization:

$$\frac{MP_K}{r} = \frac{MP_L}{w}.$$

3. Firm pricing with Market Power:

$$MC = P \left(1 + \frac{1}{\epsilon_P} \right).$$

Not graded: Use as Scratch Paper

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