Final Exam
Principles of Economics with Calculus
Caltech/edX
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Question 1

- Consider the problem of a rational consumer with an experienced utility function given by $8\sqrt{x}+m$. Let $p = \$1$ p/unit denote the market price of good x.
- Suppose that, initially, the firm selling the good matches his purchases as follows: for every x units that he buys, he gets an additional sx units for free.
- Based on customer feedback, the firm is considering eliminating the matching policy and introducing instead a price rebate of size r per-unit purchased. Note that under the rebate policy, the consumer gets back $\$r$ for every unit that he purchases
- QUESTION: What is the value of r (as a function of s) that leaves the consumer indifferent between the two situations?

Question 2

- Consider a market in which aggregate demand is given by $1000-10p$, and aggregate supply is given by $10p$, where p denotes the market price.
- QUESTION: What is the maximum amount of revenue that the government can raise using a per-unit sales tax on consumers?

Question 3

- Consider an economy in which a monopolistic firm serves two identical, but separate markets, called A and B.
- The aggregate inverse demand in each market is given by $1000-q$.
- The cost function for the monopolist is given by $(q_A+q_B)^2$, where q_A and q_B denotes the amount sold in each market.
- Suppose that each market is regulated by a separate government, and that the government of market A requires the monopolist to sell exactly 250 units on its market.

- Suppose also that the monopolist is allowed to charge different prices on each market, but is not allowed to engage in more sophisticated forms of price discrimination.
- QUESTION: Given these policies, what is the total amount produced by the monopolist in equilibrium?

Question 4

- Consider an oligopolistic market with two firms. Each of them produces using a cost function given by $c(q) = q^2$.
- The aggregate demand in the market is given by $1000 - p$.
- Suppose that, in order to increase production, the government gives the firms a \$100 per-unit produced subsidy. The cost of the subsidy is financed with an identical lump-sum tax on consumers.
- QUESTION: What is the total level of production in the market?
- QUESTION: What is the equilibrium price in the market?

Question 5

- Consider the same setting as in the previous question.
- Suppose that firms are NOT owned by consumers.
- Let s denote the size of the per-unit subsidy/tax given to the firms. Let positive values of s denote subsidies, and negative values of s denote taxes.
- QUESTION: What is the value of s that maximizes total consumer well-being? (Note: Don't forget to add the sign in entering your answer, if necessary).

Question 6

- Consider a market in which consumption of the good being traded generates a positive externality.
- There are 100 identical consumers, each with a utility function given by $\frac{1}{2}\sqrt{q} + m + \sqrt{G}$, where G denotes the total level of consumption in the market.
- The good is sold by competitive firms that produce with a constant marginal cost of \$1/unit.

- QUESTION: What is the difference between the optimal level of total consumption minus the amount of total consumption generated by the market?

Question 7

- Consider the same setting as in QUESTION 6, but now assume that the good is sold by a monopolist that produces using the same technology.
- QUESTION: In this case, what is the difference between the optimal level of total consumption and the level of total consumption in equilibrium?

Question 8

- Consider the problem of a competitive firm which has fixed costs of \$1000, semi-fixed-costs of \$1000, and variable costs given by q^2.
- QUESTION: What is the maximum market price at which the firm decides to supply zero?