Economics 212
Microeconomic Theory
Final Exam
December 16- 17, 2020
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Instructions

- The exam is timed within the writing window and is three and one-half hours in length. The exam window will open at 12pm EST on December 16 and close at 6pm EST on December 17. Once you begin the exam you must continue until you are finished or until your time has expired. You will be allowed an extra 20 minute window to upload your answers.
- CALCULATORS ALLOWED: Casio 991
- The exam consists of two sections: Section A has five short answer questions and is worth 25 marks and Section B has five problems and is worth 75 marks.
- Please upload your answers in a single Word or PDF file to the course onQ page
- For full marks you must correctly derive your answers and show all work.
- Please ensure that your student number appears on each page of your answers.
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Faculty of Arts and Sciences
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Section A: Five questions, each worth 5 marks, for a total of 25 marks.

1.   A firm has a production function given by Q = MIN {L ; 5K}. Over time, the production function evolves to become Q = MIN {2L ; 10K}. Show that this represents technological progress.

2.   Consider the following statement: "A firm uses labour and capital to produce output according to a Cobb-Douglas technology. A decrease in the wage rate will lead the firm to use more labour and less capital and to produce the given output at a lower cost." Explain and illustrate whether this statement is true, false or uncertain.

3.   A monopolist faces a market demand function given by P = 8 – Q. Assume you know nothing about the cost structure of the firm. Would the monopolist ever choose to sell 5 units of output? Can you even determine the answer? Explain.

4.   Art produce tables, T, in his workshop using labour and capital according to the production function $T = L^{1/2}K$. In the short run Art uses 16 units of capital equipment at a cost of $500 per unit. The next best use of Art's time is a job that pays him $40 per hour. Derive Art's short run production function, his demand for labour, and his short run total cost function.

Section B: Five problems, each worth 15 marks, for a total of 75 marks. Each part of each question is worth five marks.

1.   A perfectly competitive firm has a production function given by $Q = L^{1/3}K^{1/3}$, where q is output, L is labour and K is capital.

 a)   Derive the conditional input demand functions of the firm.12 pages

b)   Derive the long-run total cost function for the firm. Sketch the long run cost curve, labelling at least three point on it assuming the wage rate is 25 and the rental rate is 64.

c)   In the short-run, the firm uses 8 units of capital. Derive the firm's short-run demand for labour and its short-run total cost function. Given a product price of P, derive the short-run supply function of the firm.

2.   The long-run cost function of a firm in a perfectly competitive market is given by $C(q)=200q-10q^2+.5q^3$, where q is firm output. Market demand is given by $Q^D=20,000-10P$, where Q is market output and P is price.

a)   Solve for the long-run equilibrium values of price, output per firm, the number of firms and market output.

b)   Suppose that market demand increases by 4,500 units at each price. Solve for the new equilibrium values of price, output, output per firm and number of firms in the long-run equilibrium.

c)   Return to the original demand function used in part a). Now suppose that a change in tastes means that consumers are willing to pay $100 more for each unit of the good. Solve for the new equilibrium values of price, output, output per firm and the number of firms in long run equilibrium.

3.   Consider a duopoly that faces a market demand given by P=12,000-60Q, where P is product price and Q is market output. The two firms in the market have cost structures as follows: firm 1 has costs given by $C_1= 600q_1$, while firm two has costs given by $C_2=400q_2$, where subscripts indicate the respective firms. The output in the market is equal to the sum of the firm outputs.
a)   Solve for the Cournot equilibrium values of price, market output and firm outputs.
b)   Suppose firm 1 chooses its output level first and firm 2 follows. Solve for theStackelberg equilibrium values of price, market output and firm outputs.
c)   Draw the two reaction functions and clearly label the Cournot outcome and the Stackelberg outcome. Explain the rationale for the Cournot outcome. Why does the stackelberg out come differ (think in terms of the leader's behaviour).

4.   The market for food processors is perfectly competitive and characterized by an inverse demand function of the form $P = 700 – 10Q$ and an inverse supply function of the form $P = 10Q - 300$.
a)   Determine the equilibrium values of price and quantity in the market and calculate the elasticities of demand and supply at the equilibrium.
b)   The government decides to offer a subsidy on food processors at the rate of $100 per unit. Calculate the new equilibrium prices and output level and explain how the subsidy is shared between producers and consumers. Relate this division of the burden to the elasticities calculated in part a)
c)   Now suppose that consumers are willing to buy 50 more units at each price. Determine the new equilibrium values of price and quantity.

5.a) Sara is an up and coming sports star with a pro contract. She wishes to leverage her pro status by bringing in endorsements. She has hired Jen to be her personal manager and help bring in endorsements. Jen has offered Sara two options for payment: a flat fee of $120,000 or 20% of the endorsement revenue. Jen will expend resources to help Sara and has two choices: a low effort level that will cost Jen $20,000 and bring in $700,000 in revenue and a high effort level that costs Jen $50,000 and brings in $1,200,000 in revenue. In this two by two game, Sara's payoffs are her endorsement revenues less Jen's fees and Jen's payoffs are her fees from Sara less her resource costs. Calculate the payoffs to each player and display it in a two by two payoff matrix.
b) The game is played sequentially. Sara first chooses her payment option and then Jen chooses her effort level. Before they sign the contract, Jen tells Sara that Jen is very committed to working hard on Sara's behalf, regardless of which payment option is chosen. Draw an extended form game. Solve the game and explain the reasoning behind the outcome. Was the promise Jen made to Sara credible? Briefly explain.
c) Team A and Team B are competing in the following game: There are 25 flags planted on a beach. On its turn a team can take 1, 2, 3, or 4 flags. The team that takes the last flag wins. Team A chooses first. You are the captain of Team B. Using backward induction, devise and explain a strategy that guarantees your team will win.