HAND IN

Economics 212
Microeconomic Theory
Final Exam
December 17, 2019
Instructors: Art Stewart
Eric Richert

Instructions

- **The exam is three hours in length.**
- **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 write your answers in the space provided in this booklet. You may do rough work on the back of the pages or continue an answer there if you run out of space. Please indicate that your answer continues on the back of the page.**
- **For full marks you must correctly derive your answers and show all work.**
- **Proctors are unable to respond to queries about the interpretation of exam questions. Do your best to answer the exam questions as written.**
- **Please write your student number and section of the course in the space below.**
- **This material is copyrighted and is for the sole use of students registered in Economics 212 and writing this exam. This material shall not be distributed or disseminated. Failure to abide by these conditions is a breach of copyright and may also constitute a breach of academic integrity under the University Senate's Academic Integrity Policy Statement.**

Faculty of Arts and Sciences
Queen's University

STUDENT NUMBER: _____

SECTION: _____

Section A: Five questions, each worth 5 marks, for a total of 25 marks.

1. A firm has a production function given by $Q=LK^{1/2}$, where L is labour and K is capital. Draw and appropriately label at least three points on the isoquant for Q=10. For the isoquant prove that MRTS decreases as L increases.

2. A firm initially has a production function given by $Q=L^{1/2}K^{1/2}$. Over time the production function changes to Q=LK. Show that this change in the production function represents technological progress.

3. "A firm uses capital, K, and labour, L, to produce output, Q, according to a Cobb-Douglas production function. An increase in the price of labour will lead the firm to produce using a larger capital-labour ratio and at a higher total cost if the firm chooses to produce the same level of output" Explain and illustrate whether this statement is true, false or uncertain.

4. Agatha produces mystery novels, N, using labour, L, and capital, K, according to the production function $N = LK^{1/2}$. In the short run, Agatha uses four units of capital equipment at a cost of $2,000 per unit. The next best use of Agatha's time is a job where she could earn $30 per hour. Write Agatha's short run production function, her labour demand function and derive her short-run total cost function.

5. A firm produces output according to the production function q=Min{L; 4K}. The firm wishes to produce 100 units of output. Find the cost minimizing bundle of inputs. What is the average cost of producing the output given input price w for labour and r for capital?

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 $q=10L^{1/2} K^{1/2}$, where q is output, L is labour and K is capital.
   a) Derive the conditional input demand functions of the firm.

b) Derive the long-run total cost function for the firm. What is the cost of producing 5000 units of output when the price of labour is $25 and the price of capital is $64 per unit?

c) In the short-run, the firm uses 9 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 $C(q)=400q-10q^2+.2q^3$, where q is firm output. Market demand is given by $Q^D=50{,}000-50P$, 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 40,000 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) If the price of labour that is used in this industry were to increase when product demand increases in part b) what would the shape of the long run industry supply curve be? Briefly explain your reasoning.

3. Consider a duopoly that faces a market demand given by P=8000-20Q, 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 $C_1 = 800q_1$, while firm two has costs given by $C_2=200q_2$, 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 the Stackelberg equilibrium values of price, market output and firm outputs.

c) Now suppose that firm 1 buys firm 2 and acts as a monopolist in the market. The new firm decides to produce using only the plant of firm 2. Solve for the equilibrium values of price and output. Compare the monopoly output to the market outputs in part a) and part b) on a diagram of the market demand curve.

4. The market for toasters is perfectly competitive and characterized by a demand function of the form $Q^D=700-6P$ and a supply function of the form $Q^S=100+4P$.
   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 levy a tax on toasters at the rate of 10%. Calculate the new equilibrium prices and output level and explain how the burden of the tax is shared between producers and consumers. Relate this division of the burden to the elasticities calculated in part a).

c) Now suppose that the supply curve is perfectly inelastic. How does this change how the burden of the tax is shared? Explain using a diagram.

5. Consider the payoff matrix below which shows two players each with three strategies.

		Player 2		
		A2	B2	C2
Player 1	A1	25, 16	18, 17	20, 18
	B1	24, 25	17, 28	18, 23
	C1	26, 22	16, 21	16, 19

a) Find all Nash equilibria in pure strategies for this simultaneous choice, one-play game. Explain your reasoning.

b) Draw the game in extended form where player 2 chooses first and player 1 follows. What is the outcome of this game? Explain your reasoning.

c) Can player 1 bribe or threaten player 2 to get an outcome that player 1 prefers? Explain your reasoning.