

HAND IN

**Economics 212  
Microeconomic Theory  
Final Exam  
August 3, 2018  
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**Faculty of Arts and Sciences  
Queen's University**

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**Instructions**

- Please write your answers in the answer booklets provided. Make sure to record your student number on the front of all booklets used.
- The exam is THREE hours in length.
- CALCULATORS ALLOWED: Casio FX – 991
- There are 11 questions that add up to 100 points.
- 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, state any assumptions that you make.

**GOOD LUCK!**

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1. [10] Francisco has a quasi-linear utility function of the form  $U(x,y) = 2\sqrt{x} + 4y$ . Let  $I$  denote his total income and  $P_x$  and  $P_y$  denote the prices of good  $x$  and good  $y$ .
  - a. [5] Derive Francisco's demand curve for  $x$  as a function of the prices,  $P_x$  and  $P_y$ . Verify that the demand for  $x$  is independent of the level of income at an interior optimum.
  - b. [5] Derive his demand curve for  $y$ . What happens to the demand for  $y$  as  $P_x$  increases? Is  $y$  a normal good?
2. [5] Suppose that Justin and David are the only people in the world who drink strawberry milk. Moreover, their *inverse* demand curves for strawberry milk are, respectively,  $P = 15 - 4Q_J$  and  $P = 30 - 2Q_D$ , and, of course, neither one can consume a negative amount. Write down the market demand curve for strawberry milk, as a function of all possible prices.
3. [15] In a perfectly competitive market, the market supply curve is given by  $Q^s = 43P^s$  and the market demand curve is given by  $Q^d = 300 - 7P^d$ .
  - a. [3] Find the equilibrium market price and quantity demanded and supplied in the absence of price controls.
  - b. [4] Suppose a price ceiling of \$4 per unit is imposed. What is the quantity supplied with a price ceiling of this magnitude? What is the size of the shortage created by the price ceiling?
  - c. [4] Find the consumer surplus and producer surplus in the absence of a price ceiling. What is the net economic benefit in the absence of the price ceiling?
  - d. [4] Find the consumer surplus and producer surplus under the price ceiling. Assume that rationing of the scarce good is as efficient as possible. What is the net economic benefit in this case? Does the price ceiling result in a deadweight loss? If so, how much is it?
4. [5] For a firm with production function  $Y = 40(KL)^\alpha$  where  $\alpha \in (0,1)$ , solve for the input demand function for labour. The output price is  $p$ , and input prices for labour and capital are  $\omega_L$  and  $\omega_K$ , respectively.
5. [5] Aubrey produces hit singles,  $H$ , using labour,  $L$ , and capital,  $K$ , according to the production function  $H = L^{2/5}K$ . In the short run, Aubrey uses 3 units of capital equipment at a cost of \$1,000 per unit. The next best use of Aubrey's time is making inspirational memes for which he could earn \$35 per hour. Write

Aubrey's short run production function and derive his short-run total cost function.

6. [5] Jane's utility function over leisure ( $L$ ) and other goods ( $Y$ ) is  $U(L, Y) = 2Y + LY$ . She purchases other goods at a price of \$1, out of the income she earns from working at the hourly wage rate,  $w$ .

Does Jane's optimal number leisure hours depend on the wage rate? What is the optimal number of hours she would like to have for leisure.

7. [10] Maria has a utility function given by  $U = 2I + 10\sqrt{I}$  where  $I$  denotes her income. She is considering two job opportunities. The first, working at an accounting firm, pays a guaranteed salary of \$40,000. The other, delivering meals for EWBAR Eats, pays a base salary of \$10,000, but offers the possibility of a \$60,000 bonus on top of the base salary. Maria is an optimist, she believes that there is a 0.50 probability that she will earn the bonus.

- a. [3] What is the expected salary under each offer?
- b. [5] Which offer gives her the higher expected utility?
- c. [2] Based on the above answers, how would you describe Maria's risk preferences?

8. [20] Consider a duopoly that faces a market demand given by  $P=20,000-20Q$ , where  $P$  is product price and  $Q$  is market output. Firm 1's costs are given by  $C_1=500q_1$ , while firm 2's costs given by  $C_2=800q_2$ , where subscripts indicate the respective firms. The output in the market is equal to the sum of the firm outputs.

- a. [5] Solve for the Cournot equilibrium values of price, market output and firm outputs.
- b. [5] 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. [5] Suppose instead that firm 2 is the first mover. Solve for the Stackelberg equilibrium values of price, market output, and firm outputs.
- d. [5] Now suppose that the two firms merge and become a monopolist in the market. The new firm decides to produce using only the factory of firm 2. Solve for the equilibrium values of price and output. Was the decision to use firm 2's factory profit maximizing?

9. [5] A firm has the cost function  $C = 800 + 0.4Q + 0.2Q^2$ . Find its long run supply curve and its *long run* shut down price.
10. [5] A troll's production function of fake-news is  $Q = \min(2K, 4L)$ , where  $Q$  is the number of units of output (articles) produced using  $K$  units of capital and  $L$  units of labor. The factor prices are  $w = 4$  (for labor) and  $r = 1$  (for capital). On an optimal choice diagram with  $L$  on the horizontal axis and  $K$  on the vertical axis, draw the isoquant for  $Q = 10$ , indicate the optimal choices of  $K$  and  $L$  on that isoquant, and calculate the total cost.
11. [15] Consider the game illustrated below:

		Laurel	
		B1	B2
Yanny		A1	5, 10
		A2	4, 5      3, 7

\* This pop culture reference will probably be a relic by the time you are writing this exam.

- [5] Solve for all the Nash equilibria in pure strategies. Explain your reasoning.
- [5] If the game was played sequentially, with Yanny going first, find the outcome. Explain your reasoning.
- [5] Now, suppose Yanny and Laurel play a different game that has the payoff matrix below, where  $y > 0$ . For what values of  $y$  do both players have a dominant strategy? Solve for all the Nash equilibria in these cases.

		Laurel	
		D1	D2
Yanny		C1	14, 14
		C2	9+y, 9-y      5, 5