95

KEY

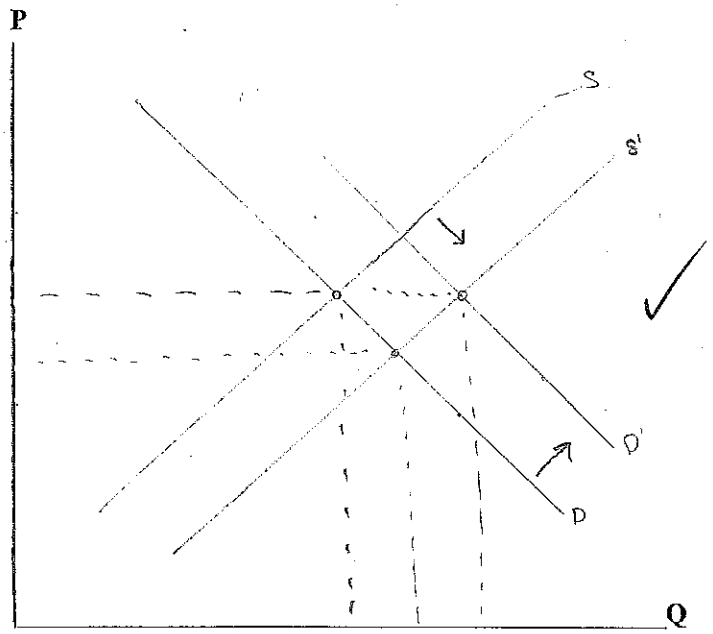
ECO 610 Midterm Exam
July 2018

Name

100 points total. Point values for each question are as indicated. Answer each question in the space provided. General advice: show your work, including any formulas or diagrams that you use in reasoning through your answers.

1. (10 pts.) Story line from the *Lexington Herald-Leader* several weeks ago: "OPEC oil ministers announce a significant increase in production just as the summer driving season begins in the U.S." (Summer driving season refers to families taking vacations in their cars.) Two things are happening simultaneously that likely will affect the retail market price and market output for gasoline in the U.S. Using supply and demand analysis, illustrate and explain what you think will happen in retail gasoline markets. Can you say with certainty whether equilibrium price will rise or fall? Whether equilibrium quantity will rise or fall?

10



Retail gasoline market

Oil supplies are increasing production of oil just ahead of the summer driving season, shifting the supply curve.

Demand for gasoline also increases due to family vacations increasing in this period.

New Equilibrium would be at P_2 and Q_2. We cannot say with certainty whether price will fall or rise because it is dependent on the magnitude of the shift, but we can say quantity will increase. For this instance, if we say the two effects have roughly the same magnitude P_2 would equal P_E as depicted.

2. (5 pts.) "Subaru's Got a Big Problem: It's Selling Too Many Cars." (WSJ, 8/21/13) Was Subaru's problem due to the law of diminishing returns or because of diseconomies of scale? Briefly explain.

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Subaru saw issues because they were too conservative in their sales projections at the time their factories were built. As sales took off, management has tried to ramp up production as much as possible in existing plants to keep up with demand. There could be presence of both phenomenon here. First, the law of diminishing returns is at play because they are trying to ramp up production within existing plants (holding K constant) as they aren't expanding the facility. So adding more labor to boost output. Secondly, they are hesitant to expand and experiencing diseconomies of scale to a degree for fear the market can't support another Subaru plant in the US. for the output it would produce. Or demand will shift [illegible]

3. (15 pts.) Different countries answer the three basic economic questions in different ways. Briefly explain the three basic questions and the two different types of economic systems. Then describe in which direction North Korea seems to be heading, and in which direction Venezuela seems to be heading.

15

All economic systems answer the question of what, how, and for whom. The two different types of economic systems are centrally planned economies and free market systems. In a centrally planned economy, the what, which tells what will be produced, is decided by a central office or government. Control of assets is often joint – socialist. The how is determined by a central planner who allocates resources, capital, and labor. The for whom is also decided by the central office/government, and rations are one possible way goods are distributed. In free market economies, what will produced is decided by the consumer. Consumer sovereignty reigns, and they drive what will be produced by what they buy. The how is answered by profit seeking firms who wish to produce at the cheapest/most economically efficient way. Ownership of resources is at the individual or company level. The for whom is decided by consumers who have a desire for a good and have the money available to buy it.

North Korea, although still centrally planned in many aspects is beginning to trend towards a market economy. Many small markets have grown around the country where consumers can buy and sell like in other free markets. Venezuela on the other hand was a free market but recently changed to a centrally planned system. Planning issues have led to big shortages of basic goods. excellent answer!

4. (5 pts.) If Q = 6, AFC = 20. If Q = 3, then ATC = 70. What is TVC if Q = 3?

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AFC = 20

Q = 6

TFC = (AFC)(Q) = 120

for 6

Q = 3 ATC = 70

TC = 210

TC = TFC + TVC

TVC = TC - TFC

TVC = 210 - 120 = 90

✓ TVC = 90

5. (20 pts.) As supervisor of an Amazon fulfillment center, you oversee a production process that has three primary factors of production: (1) a warehouse of given size and configuration, which we will take as fixed over the time period under consideration; (2) humans, who stand at work stations where they pack boxes with items that robots bring to them; and (3) robots, who travel around the warehouse picking out shelves containing items that people like me have ordered online. You are pondering whether the mix of humans (L) and robots (K) under the current configuration is optimal, i.e. minimizes cost. Currently there are twenty work stations with one human at each one and one hundred little orange robots motoring around the warehouse bringing things to the humans. With this mix you are able to process 500 orders (Q) per hour on average. Having observed productivity when the number of humans is increased or decreased by one and when the number of robots is increased or decreased by one, you have put together the following productivity matrix:

		Robots (K)		
		K = 99	**K = 100**	**K = 101**
Humans (L)	**L = 19**	Q = 475	Q = 480	Q = 484
	L = 20	Q = 495	Q = 500	Q = 504
	L = 21	Q = 512	Q = 518	Q = 523

Now for the question: If the total compensation you have to pay humans is $20 per hour, and the lease rate on robots is $10 per hour, what do you think about the mix of labor and capital under your current configuration? Too much of one and not enough of the other? Just right to minimize costs? Explain your reasoning, and show the formula you use in arriving at your answer.

15

$$\frac{MP_L}{w} \gtreqless \frac{MP_K}{v} \rightarrow \frac{\Delta Q/\Delta L}{w} \gtreqless \frac{\Delta Q/\Delta K}{v}$$

$$\frac{18}{20} \gtreqless \frac{4}{10} \rightarrow \frac{18}{20} \gtreqless \frac{4}{10} \rightarrow \underset{L \quad K}{.9 > .4}$$

✓ Too capital focused, should increase labor until MP_L & MP_K are equal, then it is the optimal configuration. I know labor should increase because $MP_L > MP_K$ meaning that another dollar spent on labor will increase output more than a dollar spent on capital.

As an alternative way of expressing the logic of your answer, calculate the marginal cost of increasing output by one order per hour by adding another unit of labor and compare it to the marginal cost of increasing output by one order per hour by adding another unit of capital.

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Labor $: $\frac{\$/hr}{\Delta Q/hr} = \frac{20}{18} = \$1.11$

Capital $: $\frac{\$/hr}{\Delta Q/hr} = \frac{10}{4} = \$2.50$

✓ adding another order by ↑ labor costs $1.11 but adding another order by ↑ capital it costs $2.50

6. (15 pts.) The Kentucky Lottery Commission asks you to conduct some marketing research for them. They would like to know the income elasticity of demand for instant scratch-off lottery tickets. You find that when looking across consumers, households with average annual incomes of $40,000 spend roughly $100 per year while households with average annual incomes of $60,000 spend roughly $80. Calculate the income elasticity of demand for lottery tickets, showing your work.

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$\varepsilon_{x,\text{income}} = \dfrac{\Delta Q/(\frac{1}{2}Q_0 + Q_1)}{\Delta P/(\frac{1}{2}P_0 + P_1)}$

$\varepsilon_{x,\text{income}} = \dfrac{(100-80)/(\frac{1}{2}(80+100))}{(40-60)/(\frac{1}{2}(40+60))}$

$\varepsilon_{x,\text{INC}} > 0$ = normal → > 1 luxury, $0 < \varepsilon < 1$ neces

$\varepsilon_{x,\text{INC}} < 0$ = inferior

$\dfrac{(20)/(\frac{1}{2}(180))}{-20/(\frac{1}{2}(100))} = \dfrac{20/(90)}{-20/(50)} = -0.555$ ✓

$\varepsilon_{x,\text{income}} = -0.56$ = inferior good

Out of curiosity, looking at expenditures on college education across the same two income groups, you find that 35% of children in the lower income group attend college after high school, while 45% of the higher income group attend college. Calculate the income elasticity of demand for college education, showing your work.

$\varepsilon_{x,\text{income}} = \dfrac{(45-35)/(\frac{1}{2}(35+45))}{(60-40)/(\frac{1}{2}(60+40))} = \dfrac{10/40}{20/50} = \dfrac{.25}{.4}$

$\varepsilon_{x,\text{income}} = 0.625$ = normal necessity ✓

What kind of good are lottery tickets? What kind of good is higher education?

lottery tickets = inferior good

higher education = normal good; necessity

7. (15 pts.) Your sister is contemplating buying a bakery that specializes in cupcakes. She shares the most recent income statement that she obtained from the owner, and asks for your opinion. It reflects annual revenues of $250,000. Costs include materials and supplies of $50,000, wages for hourly employees of $80,000, insurance and taxes of $20,000, and utilities of $30,000. The sale price of the bakery business is $300,000, which includes the building, equipment, and property. To buy this business your sister proposes to cash in her mutual fund (long-run expected rate of return = 6%). She would also have to quit her current job where she earns $60,000 managing a local restaurant. (a) Calculate the accounting profits for this business. (b) Calculate the economic profits from this business, explaining how and why they differ from the accounting profits. (c) After listening to your reasoning, your sister decides to quit her job, cash in her mutual fund, and go into business for herself baking cupcakes. What does that tell you about the value your sister places on being her own boss?

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TR = 250,000

sale price = 300,000

exp. costs

mat/sup	50,000
wages	80,000
insur/tax	20,000
util.	30,000
	180,000 total exp. costs

implicit costs

mut. fund int. .06(300,000) = 18,000

forfeight income 60,000

78,000 total imp. costs

a) accounting profits

acc profit = TR - exp. costs

= 250,000 - 180,000

acc. profit = 70,000 ✓

b) economic profits = TR - exp. costs - implicit costs

= 250,000 - 180,000 - 78,000

econ. profits = -8,000 ✓

economic profits differ from accounting profits because they take into account the implicit opportunity costs. These costs include the forfeited salary from her previous job, and the forfeited interest accumulation from her mutual fund.

c) this shows that being her own boss is worth a "pay-cut" of 8,000 dollars. ✓

8. (5 pts.) Why might the costs of transporting a standard-sized container of goods across the ocean fall as the size (scale) of the ship increases?

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Economies of scale benefit the increase, particularly as a result of engineering relationships. As the size of the ship increases by one unit it's capacity would increase by more than one unit, per the cube-square rule. It would be cheaper then, on a per container basis, as ship size increases.

✓

Fixed set-up costs would also help in this instance, as the overhead would be spread out among more containers as the ship size increases in conjunction with the engineering relation.

✓

9. (5 pts.) Prolonged drought reduces the supply of carrots, leading to higher prices. Instead of being hurt by the bad weather, carrot farmers as a group actually experience an increase in revenues. How can this be?

5.

Demand could be inelastic, so a relatively large increase in prices results in a relatively small change in quantity demanded. As a result, revenues would rise.

✓

A lack of good substitutes for carrots would also contribute to this inelasticity.

10. (5 pts.) Contrast Anheuser-Busch's multi-plant strategy with that of Proctor & Gamble, using the concepts of economies of scale and value-to-weight in your explanation.

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Within A-B economies of scale aren't as beneficial because value:weight is low, so shipping costs are significant. As a result, it makes sense for A-B to have many smaller breweries, spread out geographically, to minimize shipping costs.

✓

P&G products have a higher value:weight ratio, allowing them to take advantage of economies of scale, as shipping costs aren't so significant. This allows P&G to have fewer, but much larger plants. Because P&G has more complex product lines, they also concentrate these plants in closer proximity to each other.

✓