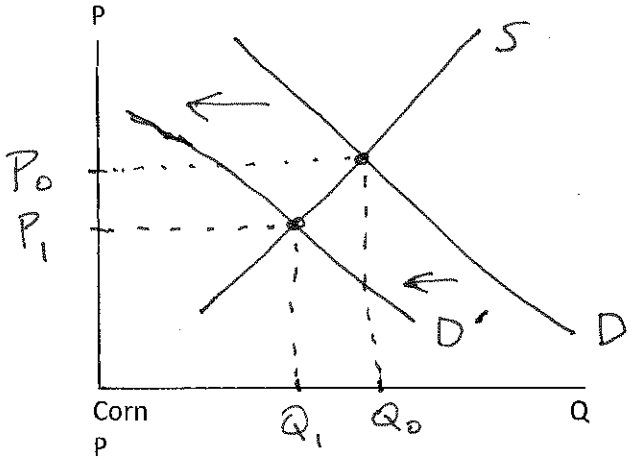
ECO 610
Midterm Exam
Fall 2017

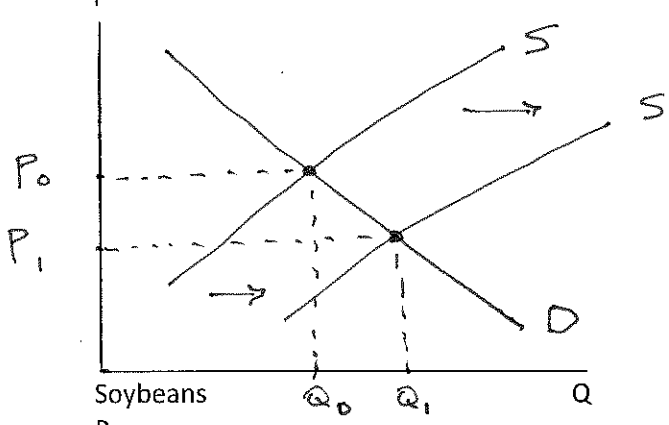
Name: KEY

100 points total. Answer each question in the space provided.

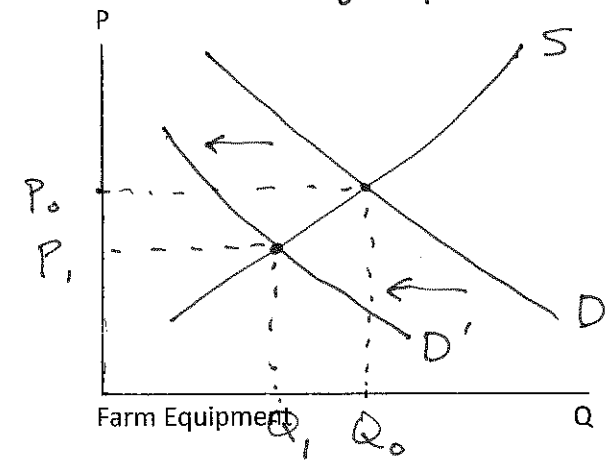
1. (15 pts.) Suppose Congress were to eliminate the ethanol program, reversing a program that has had a huge impact on the market for corn since the mid 2000's and significant ripple effects on markets for goods related to corn. Illustrate the impact of terminating the ethanol program on (a) the market for corn; (b) the market for soybeans, which in many cases can be grown on the same land that corn can be grown on; and (c) the market for farm equipment such as tractors and harvesters, used to produce corn. Briefly explain your graphical answers.



Termination of ethanol subsidy program will lead to a decrease in the demand for corn. Price and quantity exchanged will both fall.



Soybeans and corn are substitutes in production. Lower corn prices will cause the supply curve for soybeans to shift right, leading to a lower market price but greater quantity exchanged.



Demand for farm equipment used to produce corn is derived from the demand for corn. As corn prices and outputs fall, the demand for farm equipment will also fall, leading to lower price and output.

2. (15 pts.) Greyhound (GH) and Mega-Bus (MB) are the only two passenger bus companies offering daily service in the Cincinnati-Detroit city-pair market. You collect the following data on the prices charged by each bus company and the average number of passengers riding on each bus:

Month	GH Price	MB Price	GH passengers	MB passengers
June	59	65	70	61
July	59	60	62	75

a) Calculate the own-price elasticity of demand for bus travel on Mega-Bus. Show the formula you use and the numbers you use to perform the calculation. Briefly interpret your answer.

$$\varepsilon_{x,P_x} = -\frac{\%\Delta Q_x}{\%\Delta P_x} = -\frac{\frac{Q_1 - Q_0}{\frac{1}{2}(Q_1+Q_0)}}{\frac{P_1 - P_0}{\frac{1}{2}(P_1+P_0)}} = -\frac{\frac{75-61}{\frac{1}{2}(75+61)}}{\frac{60-65}{\frac{1}{2}(60+65)}}$$

$$= -\frac{\frac{14}{68}}{\frac{-5}{62.5}} = 2.57$$

demand for Mega Bus travel is elastic — consumers are relatively responsive to a reduction in price.

b) Calculate the cross-price elasticity between MB's price and GH's passenger load. Show the formula you use and the numbers you use to perform the calculation. Briefly interpret your answer.

$$\varepsilon_{Y,P_x} = \frac{\%\Delta Q_Y}{\%\Delta P_x} = \frac{\frac{62-70}{\frac{1}{2}(62+70)}}{\frac{60-65}{\frac{1}{2}(60+65)}} = \frac{\frac{-8}{66}}{\frac{-5}{62.5}}$$

$$= 1.52$$

since $\varepsilon_{Y,P_x} > 0$, Greyhound and Mega Bus travel are substitutes.

3. (10 pts.) Contrast how market systems and centrally planned systems answer the second basic economic question: How?

Three basic economic questions: What, How, and For Whom? How means what production techniques, i.e. what mix of inputs will be used, to produce the goods and services that are desired by society. In a centrally planned economy, the central planners determine what production methods will be used, and then assign inputs accordingly so that the desired outputs can be produced. In a market economy production decisions are decentralized. Firms decide what mix of inputs to employ. Profit-maximizing firms will choose the input mix that minimizes the cost of producing their chosen outputs. In so doing, they will economize on scarce and hence high-priced factors of production in favor of plentiful and hence low-priced factors of production. So input prices guide the production decisions of firms in a market economy.

4. (10 pts.) A few short-answer questions about elasticity (short answer means one sentence should suffice):
If you raise price and demand is inelastic, will total revenue go up or down?
Inelastic demand means that a relatively large increase in price will lead to a relatively small decline in quantity demanded. So total revenue will go up.

If we calculate the own-price elasticity of demand for Miller Lite Beer, and then we calculate the elasticity of demand for beer in general, in which case will we get a bigger number?
Miller Lite is more narrowly defined than "beer", so any other brand of beer is a substitute. Demand for the more narrowly defined product will be more elastic.

Why does the demand for electricity used for lighting purposes tend to be very inelastic?
Since there are no good close substitutes for electric lights (candles? daylight?), demand for electricity used for lighting purposes will be inelastic.

The income elasticity of demand for college education has been estimated to be between 3.0 and 3.5. Speaking as an economist, do you consider college education to be a necessity?
"Necessity" in economics jargon implies an income elasticity between 0 and 1. "Luxury" implies an income elasticity greater than one. So college education is a luxury good.

Which number would make the most sense if you were estimating the cross-price elasticity between Gillette Pro Fusion razor handles and Gillette Pro Fusion cartridge blades, -5.0, -0.5, 0.5, or 5.0?
Since both are required for shaving using the Gillette Pro Fusion system, and neither has any alternative use without the other, they are strong complements. A cross-price elasticity of -5.0 implies strong complementarity.

5. (15 pts.) Your brother-in-law is thinking about buying a sandwich shop where he has been working as a part-time employee. The income statement for this business shows annual revenues of $300,000. Costs include wages for hourly employees ($70,000), utilities ($30,000), wholesale cost of food and other supplies ($80,000), taxes ($10,000), advertising ($10,000), and insurance ($10,000). Your brother-in-law is about to graduate from UK and has several job offers in the $50,000 per year range. His boss, the current owner and full-time manager, pays herself no salary in this business. She and her husband own the strip mall where her sandwich shop is located, and the space occupied by her shop previously rented for $12,000 per year. If your brother-in-law buys the business from them, they would rent the space to him at the same rate. They are asking $100,000 to sell the business to him. (a) What accounting profit would show up on the income statement of this business under its current ownership? (b) Your brother-in-law asks you to help him figure out the "rate of return" he would earn on his $100,000 if he were to buy this business. Evaluate the economic profitability of the sandwich shop if he were to own and operate it, assuming all the other costs stay the same.

a) Revenues = $300,000

Costs:

wages for hourly employees	*$70,000*
utilities	*$30,000*
wholesale cost of food and other supplies	*$80,000*
taxes	*$10,000*
advertising	*$10,000*
insurance	*$10,000*
Total explicit costs	*$210,000*

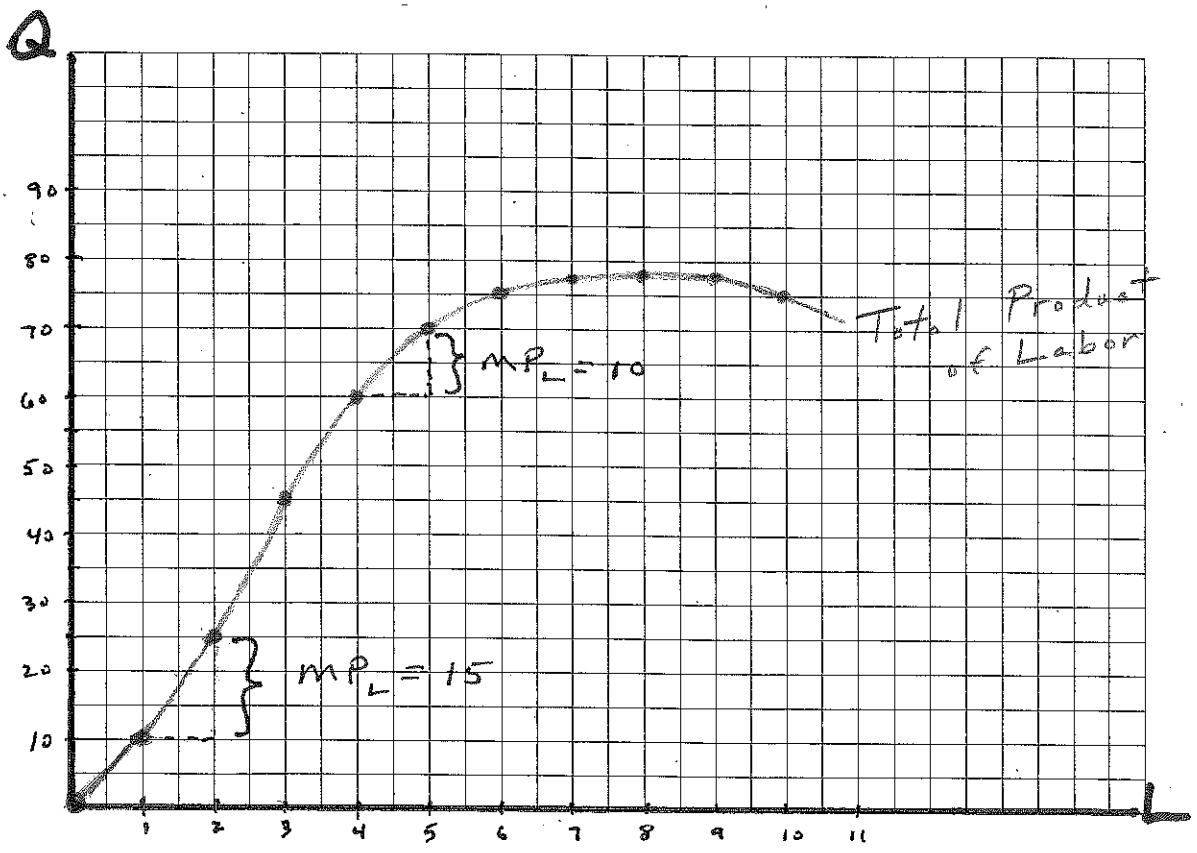
Accounting profit = Total revenue – total explicit cost = $90,000

b) Rent, which is an implicit cost to the current owners of the sandwich shop since they own the building and pay themselves no explicit rent, would become an explicit cost for your brother-in-law. Hence his explicit costs would rise by $12,000 and his accounting profit would fall to $78,000. The opportunity cost of his time would be an implicit cost, so if he values that at $50,000 his economic profit would be equal to $28,000 before he calculates the foregone interest on his $100,000 investment in buying the business.
$28,000/$100,000 = 28%, so a 28% rate of return is clearly above market rate of return he could earn elsewhere. If his next best investment would yield were, say, six percent, he would earn $22,000 in economic profit.

6. (15 pts.) You experiment with different amounts of labor in the fast-food restaurant which you own and manage. You find the following relationship between person-hours of labor (L) and the number of meals per hour produced, given the fixed capital (**K**) embodied in your current configuration of building, equipment, etc.

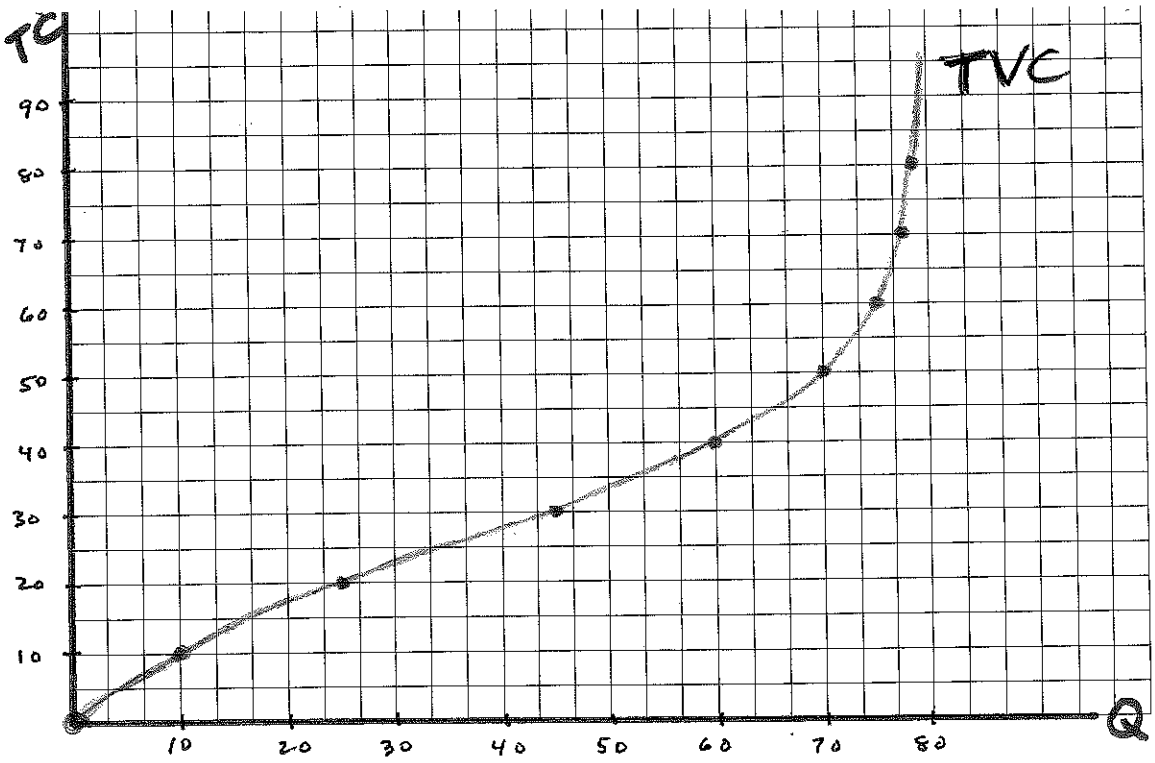
L:	0	1	2	3	4	5	6	7	8	9	10
Q:	0	10	25	45	60	70	75	77	78	78	75
$MP_L \Rightarrow$		10	15	20	15	10	5	2	1	0	−3

a) Graph the relationship between labor and output, and explain how this experiment illustrates the law of diminishing returns.



As more and more labor is added to a fixed amount of other inputs, output eventually starts to increase at a decreasing rate — the law of diminishing returns.

b) Assuming that the wage rate you pay for each additional person-hour is $10.00, graph the total variable cost curve (TVC) associated with this production process. Show the calculations you perform to get the points on your graph.

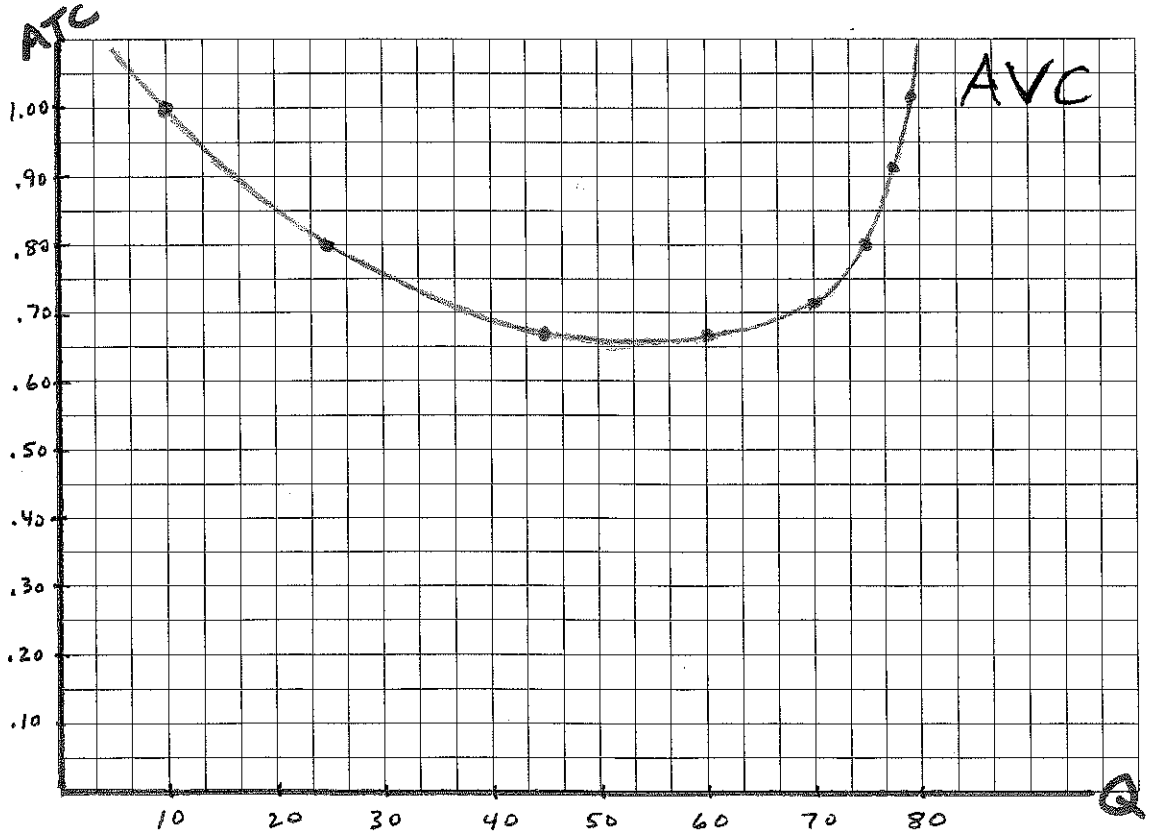


$TVC = w \cdot L$

$AVC = \frac{TVC}{Q}$

L	Q	TVC	AVC
0	0	0	
1	10	10	1
2	25	20	0.8
3	45	30	0.67
4	60	40	0.67
5	70	50	0.71
6	75	60	0.8
7	77	70	0.91
8	78	80	1.02

c) Finally, illustrate average variable cost (AVC) curve that are associated with this production process. Show the calculations you perform to get the points on the graph.



7. (5 pts.) Boeing and Airbus both recently announced changes in their approach to their vertical strategies, i.e. the vertical boundaries of their firms. What are they going to do differently going forward, and why?

Boeing and Airbus have both decided to vertically integrate upstream and make certain components of their jet planes that they previously had outsourced to independent parts suppliers. Boeing is going to make some of its own actuation equipment and wings for the new 777. Airbus is planning to build some of its own nacelles. (WSJ 9/8/17)

8. (10 pts.) Pick one product-level reason and one plant-level reason that a firm might experience economies of scale. Briefly explain each one and give an example.

Product-level reasons for economies of scale:

- ***Fixed set-up costs***
- ***Specialization of machinery or labor***
- ***Learning by doing***

Plant-level reasons for economies of scale:

- ***Engineering relationships***
- ***Economies of massed reserves (inventories)***
- ***Meshing (indivisibilities)***

9. (5 pts.) Draw a diagram that explains why Toyota finds it economical to buy rather than make tires for the automobiles it produces.

Toyota's need for tires is smaller than that produced by a MES tire plant:

Toyota's acquisition of tires