ECO 610 Final Exam
July 2020

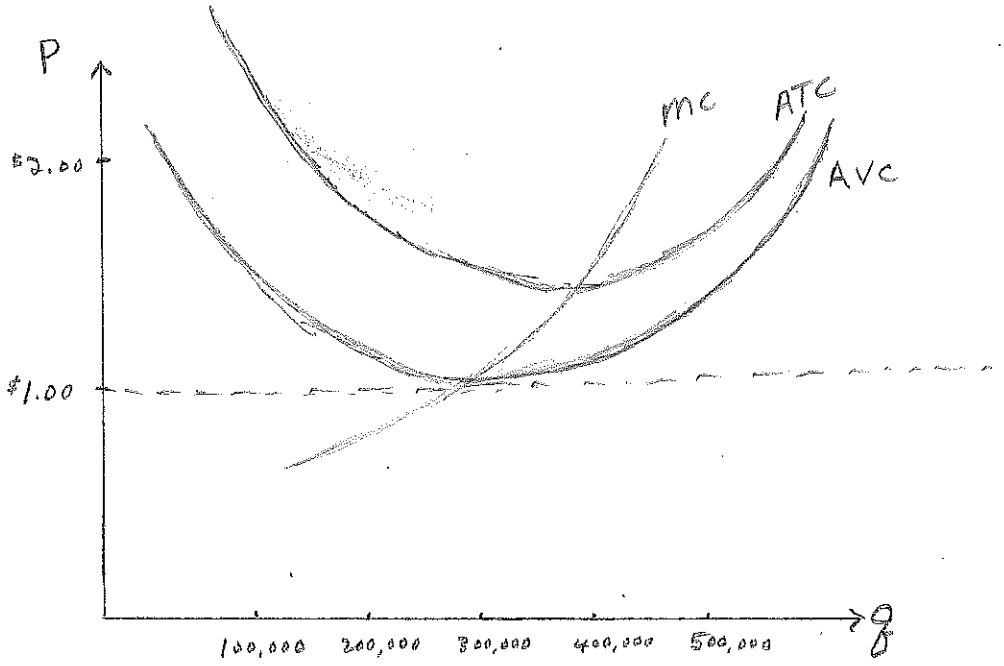
Name: KEY

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.) From an article in *Oklahoma Farm Report* (11/11/19) entitled "Size of 2019 Oklahoma Pecan Harvest Could Be Determined by Prices":

So what does the pecan crop look like this year? Rohla says "for Oklahoma, with 75% of our production being natives, its going to really depend on the price. A grower is really going to need a dollar, to a dollar fifteen per pound to really go out and start harvesting and bringing those to the market." Right now, the prices are hovering around that dollar mark, which Rohla says is going to deter some producers to go out there and pick it up. "If the market should get up to around a dollar twenty-five, he says there could easily be thirty-two, to thirty-five million pounds out in Oklahoma"

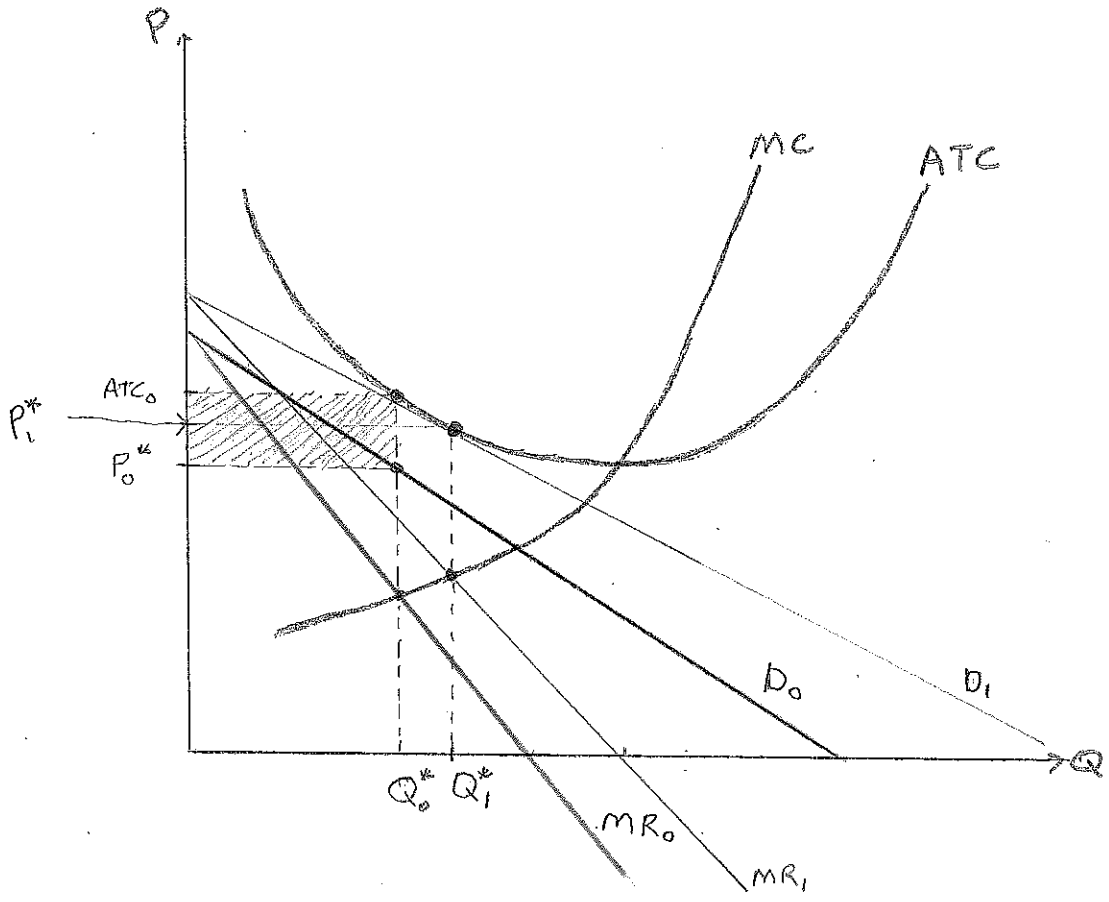
What do you infer about SRAVC and SRATC curves for Oklahoma pecan growers based on the above quote from a pecan expert? (A typical pecan grower produces several hundred thousand pounds of pecans per year.) Explain and illustrate your answer in the diagram below.



typical pecan grower

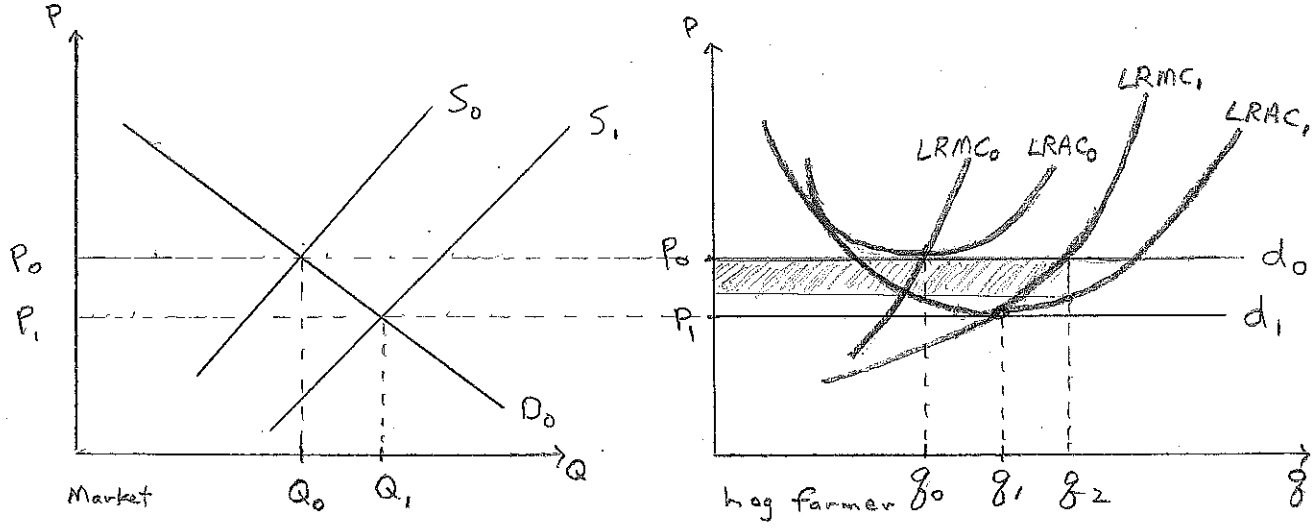
Pecan growing is a perfectly competitive industry—many producers, homogeneous product, low entry barriers—so firms are price takers and face a perfectly elastic demand curve at whatever price the market gives them. At prices below $1.00 per pound, Oklahoma growers find it unprofitable to even harvest their crops, so their average variable cost curves must bottom out around $1.00 per pound. We can't specify exactly where the average total cost curve bottoms out from the information given, but it is clear that there will be many growers scooping up and cleaning pecans when price climbs to $1.25.

2. (20 pts.) Concerns over the coronavirus pandemic have reduced the demand for restaurant meals. Currently many (most?) restaurants are suffering short-run economic losses. Illustrated below are the ATC and MC curves for a typical sit-down restaurant. Draw D and MR curves and show the optimal price and output as well as the associated (negative) profits for a restaurant that is experiencing such short-run economic losses. Then explain and illustrate what you expect to happen over time if the short-run reduction in demand for restaurant meals turns out to be a permanent change in how and where people choose to consume food.



Initially the decline in demand results in restaurants suffering economic losses. Demand is illustrated by D_0 and marginal revenue associated with that level of demand is MR_0. The loss-minimizing output is where MR_0 intersects MC, and is labeled Q_0^*. The optimal price is P_0^*, and losses per unit are the difference between ATC_0 and P_0^*. Total losses are the shaded area.
If the decrease in demand is permanent, some restaurants will exit from the market, driven out by the economic losses they are suffering. As restaurants exit, those who survive will capture the customers of their former rivals and experience an increase in demand. The eventual long-run equilibrium demand curve, marginal revenue curve, and profit-maximizing output and price are given by D_1, MR_1, Q_1^*, and P_1^*. Economic profits for firms in a monopolistically competitive market like restaurants that is in long-run equilibrium are zero.

3. (20 pts.) The year is 1990. Most pork is produced on family farms in the Midwest—farms whose primary output is corn and who raise hogs as a side product. The long-run average cost curve ($LRAC_0$) and associated long-run marginal cost curve ($LRMC_0$) for a firm using this technology are illustrated in the diagram below. The market for pork is in long-run equilibrium, with total market quantity exchanged equal to Q_0. Draw market demand and supply curves consistent with the situation in 1990, and illustrate the firm's optimal output and its profits in long-run equilibrium. Briefly explain your graphical answers.



If the pork market is in long-run equilibrium in 1990, then market price must be at a level such that producers earn zero economic profit. That occurs where firms' LRAC curves bottom out. Hence market demand and supply, D_0 and S_0, must intersect at a price, P_0, that results in zero economic profits for hog farmers. At that price, our typical hog farmer will produce that output where P=MC, or q_0, and earn zero economic profit since price also equals the minimum possible average cost of producing pork.

Now a change in technology occurs. Factory farming methods ("Power Pork," *WSJ* 1994) are applied to pork production, increasing the MES and significantly reducing the cost of producing pork. This change is illustrated by the new $LRAC_1$ and $LRMC_1$ curves. What do you predict will happen in the market for pork? Illustrate the profit position of initial adopters of the new technology. As more and more firms adopt the new technology, what happens to the profit position of Midwestern family farms still raising hogs the old way? What does long-run equilibrium look like after all market adjustments have occurred, in terms of the number of hog farms, market price and output, and economic profits of those firms who are left in the market?

The first adopter of the new technology will have average and marginal costs illustrated by $LRAC_1$ and $LRMC_1$, but face a market price still equal to P_0. Such a firm will expand output to the level where $P_0 = LRMC_1$, or q_2. Profit per unit will by $P_0 - LRAC_1$ at that output, and total profit will be the shaded area in the diagram. As more and more producers adopt the new technology, market supply will shift right and price will begin to fall. As price falls, those firms who still use the old technology will suffer economic losses, and will either exit from the industry or adopt the new factory farm technology. Eventually supply will expand enough so that price falls to P_1, with the associated market output Q_1. At that price, pork producers using the new technology will produce q_1 hogs and earn zero economic profit.

4. (10 pts.) You take over as CEO of a manufacturer of industrial parts. Your company's current pricing strategy is to mark up each item in your product line by 30% above marginal cost. You are puzzled why previous managers did this, since some of your products are very unique and other products are commodities. You instruct your marketing research department to study own-price elasticity of demand for two of your products, X and Y. They both have marginal costs of $1.00, and are currently both priced at $1.30. You find that own-price elasticity of demand for good X is 10, and own-price elasticity of demand for good Y is 1.2. How would you set prices for these two products? Explain your logic and show your work, including any formula that you use.

Good X:

$P_X = \$1.30 \quad MC_X = \$1.00$

$\varepsilon_{X,P_X} = 10$

$$\frac{P_X^* - 1}{P_X^*} = \frac{1}{10}$$

$$P_X^* - 1 = \frac{1}{10} P_X^*$$

$$\frac{9}{10} P_X^* = 1$$

$$P_X^* = \frac{10}{9} = \$1.11$$

Good Y:

$P_Y = \$1.30 \quad MC_Y = \$1.00$

$\varepsilon_{Y,P_Y} = 1.2 = \frac{6}{5}$

$$\frac{P_Y^* - 1}{P_Y^*} = \frac{1}{6/5} = \frac{5}{6}$$

$$P_Y^* - 1 = \frac{5}{6} P_Y^*$$

$$\frac{1}{6} P_Y^* = 1$$

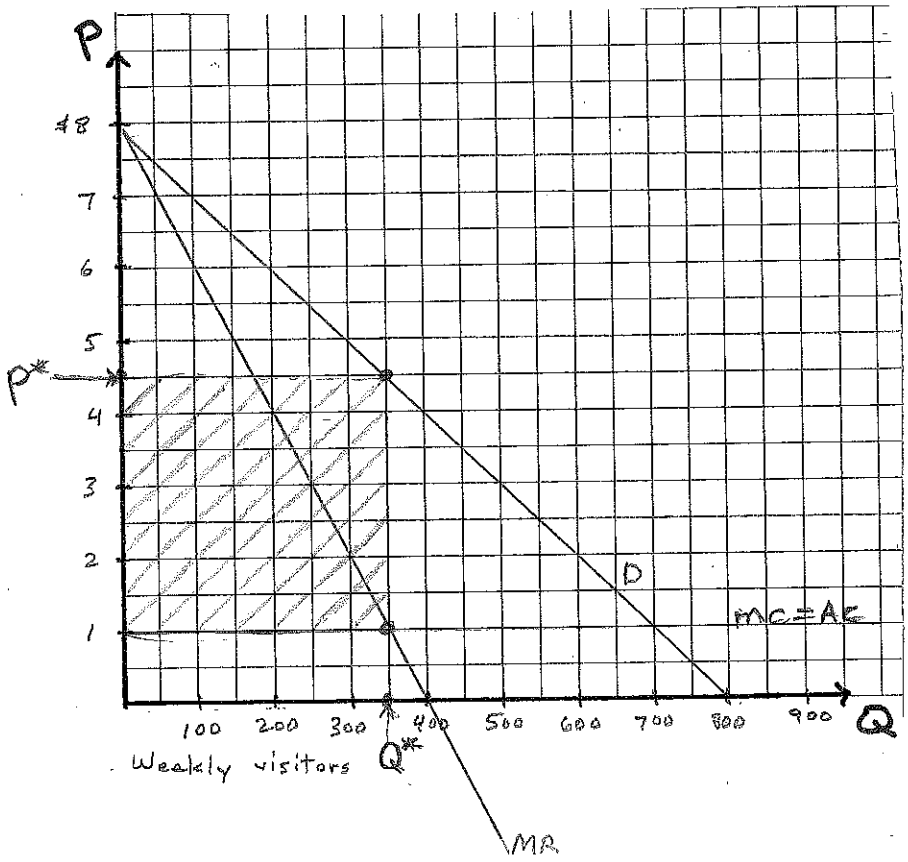
$$P_Y^* = 6$$

Use inverse-elasticity pricing rule whereby profit-maximizing price, P^*, is equal to: $\frac{P^* - MC}{P^*} = \frac{1}{\varepsilon_{X,P_X}}$

5. (5 pts.) Why do price wars sometimes break out among cruise ship operators?

Cruise ship operators must build ships and lock into schedules far in advance of when they know the actual state of demand in a given period. If they make capacity commitments anticipating a certain level of demand, and then market conditions change to drastically reduce demand, then they are faced with sailing empty ships or cutting price. See WSJ 1/29/03 and WSJ 12/04/09.

6. (15 pts.) The Nashville City Council engages your consulting company to conduct marketing research and help them determine the profit-maximizing price to charge for their version of the Parthenon. They have already determined that their cost structure is quite simple, MC = AC = $1.00 per visitor. After some market experiments, you determine that quantity demanded, measured as weekly visitors, depends on the price of admission as follows: Q = 800 – 100*P, where Q is weekly visitors and P is the price of admission. What price do you recommend that they charge, how many tickets per week will they sell, and what will their profits be? Illustrate your answer in the diagram below and briefly explain.



Q^* - where $MR = MC$

P^* - up to Demand curve at Q^*

$Q^* = 350$

$P^* = \$4.50$

$\pi = (P^* - AC)\,Q^*$

$\pi = (4.50 - 1.00)\,350$

$\pi = \$1225$

Single uniform price for everyone results in profits of $1225 per week.

7. (5 pts.) When conducting your market experiments, you noticed that when price was $6.00 or above, almost all the visitors were childless adults. But when price fell to the $2-$3 range, most of the additional customers were families with children. Can you think of any more creative pricing strategies that would increase the profits Nashville might make from their Parthenon?

You could offer a family ticket of $12 for a family of four, or charge $6 per adult and half off ($3) for children accompanying a paying adult. Any strategy whereby you separate the single adults, and charge them a higher price, from the adults with kids, to whom you want to offer a lower price, will increase your profits.

8. (15 pts.) Hansel and Gretel play a static game of complete information. Hansel has three strategy options, Top, Middle, and Bottom. Gretel has four strategy options, Far Left, Left, Right, and Far Right. The strategy options and the associated payoffs are represented in the payoff matrix below:

		Gretel			
		Far Left	Left	Right	Far Right
Hansel	Top	3, 9	6, 6	15, 12	18, 15
	Middle	0, 6	12, 15	0, 9	15, 12
	Bottom	6, 30	9, 36	12, 18	21, 27

What do you predict will be the outcome of this game? Describe step-by-step the solution strategy you use to solve for the outcome.

(1) Neither Far Left nor Right are rationalizable strategies for Gretel. (Right is dominated by Far Right. Far Left is dominated by the combination of Left and Far Right.)

(2) If Hansel knows that Gretel will never choose Far Left or Right, he will eliminate Top from consideration, because it is never a best response to Left or Far Right.

(3) The remaining 2×2 payoff matrix is:

Hansel \ Gretel	Left	Far Right
Middle	12, 15	15, 12
Bottom	9, 36	21, 27

Gretel will choose her dominant strategy Left. Knowing this, Hansel will choose his best response, Middle. This strategy pair is a Nash equilibrium, because neither player experiences ex post regret.