

Questions 1-5: multiple choice, 5 points each, circle correct answer.

1. You use fertilizer and insecticide to grow roses in your garden. Given the amounts of each that you are currently using, another pound of fertilizer applied to your rose bushes would yield an additional 10 roses, while an additional quart of insecticide would increase your rose output by 25. Insecticide costs \$5 per quart, and fertilizer costs \$2 per pound. From this information we can conclude
- a) You should use more fertilizer and less insecticide.
 - b) You should use more insecticide and less fertilizer.
 - c) You are using insecticide and fertilizer in efficient proportions.
 - d) You should grow more vegetables and fewer flowers.

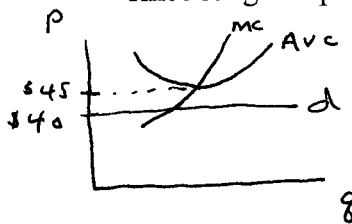
$$\frac{MP_F}{P_F} = \frac{MP_I}{P_I}$$

2. General Motors produces small cars, large cars, pickup trucks, and commercial trucks. This is probably because
- a) Economies of scale are large relative to the market for motor vehicles.
 - b) Economies of scope exist across the production of these different products.
 - c) Learning by doing is very important in the production of automobiles.
 - d) The production function for motor vehicles is characterized by increasing marginal returns.

$$C(x, 0) + C(0, y) > C(x, y)$$

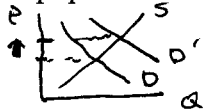
3. Which of the following markets most closely resembles the characteristics of perfect competition?
- a) Blue jeans - differentiated product
 - b) Cable TV - only one seller
 - c) Beer - differentiated, small # of sellers
 - d) Fresh vegetables - homogeneous, large # of sellers, no entry barriers

4. You are one of many firms that supply firewood in the Lexington market. Current conditions are such that the market price for a cord of firewood is \$40. Your costs are such that $MC=AVC=\$45$ at an output of 20 cords per week. At that output $AFC=\$20$. Under these conditions you should
- a) Stop supplying firewood (shut down) until demand picks up again next fall.
 - b) Produce exactly 20 cords per week, since that is where costs are minimized.
 - c) Produce that output where $MR=MC$, since you are more than covering your fixed costs.
 - d) Sell your chain saw and truck and go into some other line of business, since long-run profits are obviously negative.



$P < AVC \Rightarrow$ shut down in the short run.

5. Pork prices have gone up recently because
- Feed grain prices used to fatten hogs have recently increased.
 - A disease similar to mad cow disease has killed a lot of hogs.
 - C** Some guy named Atkins has changed the way that people eat.
 - A burgeoning wolf population has contributed to the destruction of pig domiciles.



demand for pork
has increased

6. (10 pts.) After Burton Denson graduated with honors from the American Trucking Academy, his proud (and rich) parents gave him a new \$350,000 tractor-trailer rig. At a recent class reunion of ATA alums, Burton boasted to some fellow truckers that his revenues were typically \$25,000 per month, while his operating costs (fuel and maintenance) amounted to only \$18,000 per month. The other truck drivers are all employees of various trucking companies, and bemoaned the fact that they are only averaging \$5,000 per month in salary and benefits, while Burton is taking home \$7,000. They wish that they had rich parents so that they could be in business driving their own rigs like Burton. What do you think? If you were driving for a trucking company and earning \$5,000 per month, would you be tempted to quit your job, cash in \$350,000 of your mutual funds, and buy your own truck? (Hint: this question calls for an evaluation of the economic profitability of being an independent trucker.)

Implicit Costs not included in Burton's calculations are (1) the interest earnings foregone on the \$350,000 he has tied up in his truck and (2) depreciation of his truck as it wears out with use.

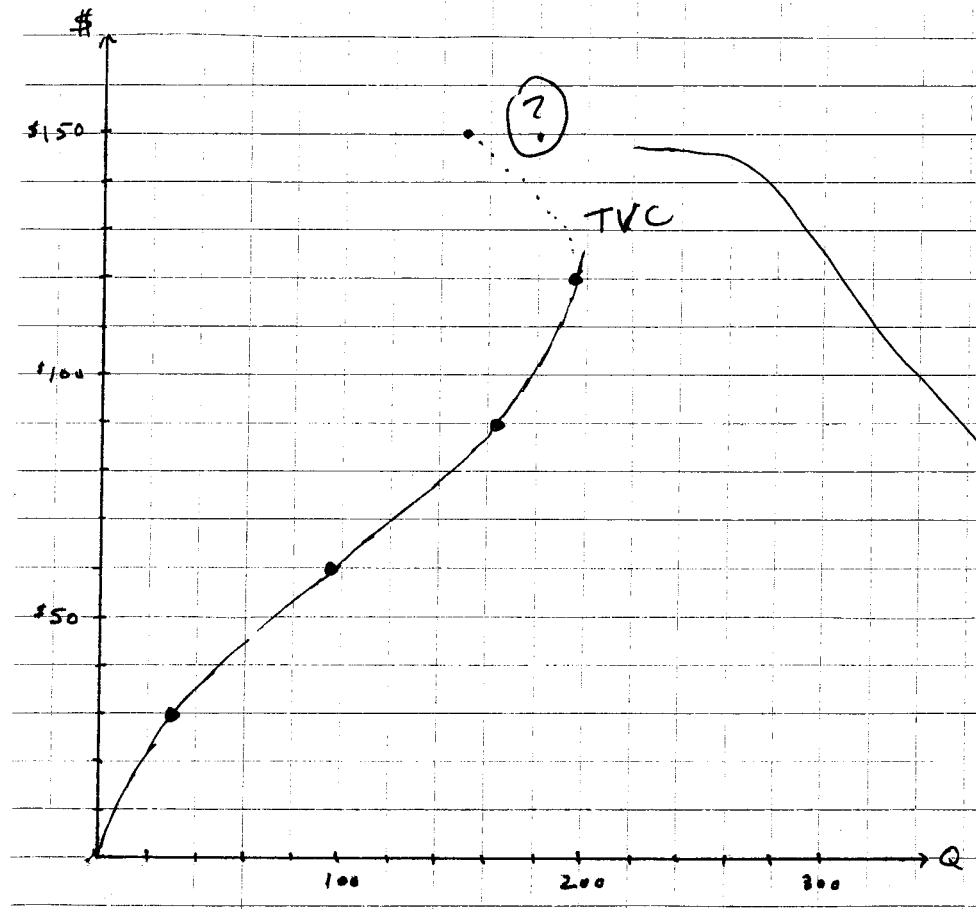
- Interest foregone: \$350,000 @ 6% (for example) would be \$21,000 per year or \$1750 per month.
- Depreciation: 10 years life on truck with zero scrap value would be \$35,000 per year if depreciation is straight line, or \approx \$3000 per month.

When those two things are taken into account, it doesn't look nearly so attractive to own and operate our own truck.

7. (15 pts.) The following table describes the short-run production relationship for a firm that produces a single output, Q , with two inputs, L and K :

K	24	24	24	24	24	24
L	0	6	12	18	24	30
Q	0	30	96	162	192	150

- a) Suppose that the wage rate, w , is \$5. Sketch the firm's total variable cost curve in the diagram below.



$$TVC = w \cdot L$$

L	Q	TVC
0	0	0
6	30	30
12	96	60
18	162	90
24	192	120
30	150	-

TVC curve does not bend backwards because you would never use $L=30$ to produce $Q=150$!!

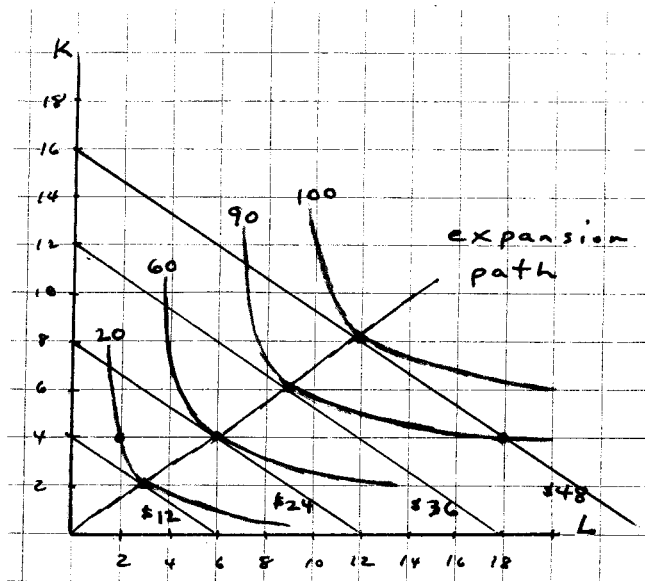
- b) Is this an example of decreasing returns to scale? Briefly explain why or why not.

NO. This is a short-run experiment where we add more and more units of a variable factor to a fixed amount of other inputs. Decreasing returns to scale is a long-run experiment where both L and K are variable.

8. (25 pts.) The following points lie on the firm's long-run expansion path:

Q	20	60	90	100
L	3	6	9	12
K	2	4	6	8

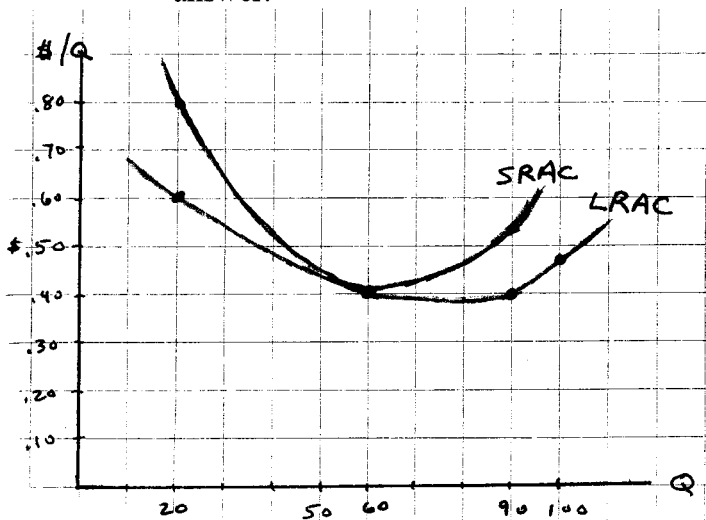
a) If the firm pays $w = \$2$ per unit of labor and $v = \$3$ per unit of capital, illustrate the firm's expansion path. Your diagram should have four isoquants and four isocost lines.



$$TC = wL + vK$$

L = 3	K = 2	TC = \$12
6	4	\$24
9	6	\$36
12	8	\$48

b) Now illustrate four points on the firm's long-run average cost curve. It would be prudent to show or explain briefly how you arrive at your answer.



$$TC = w \cdot L + v \cdot K$$

$$ATC = TC / Q$$

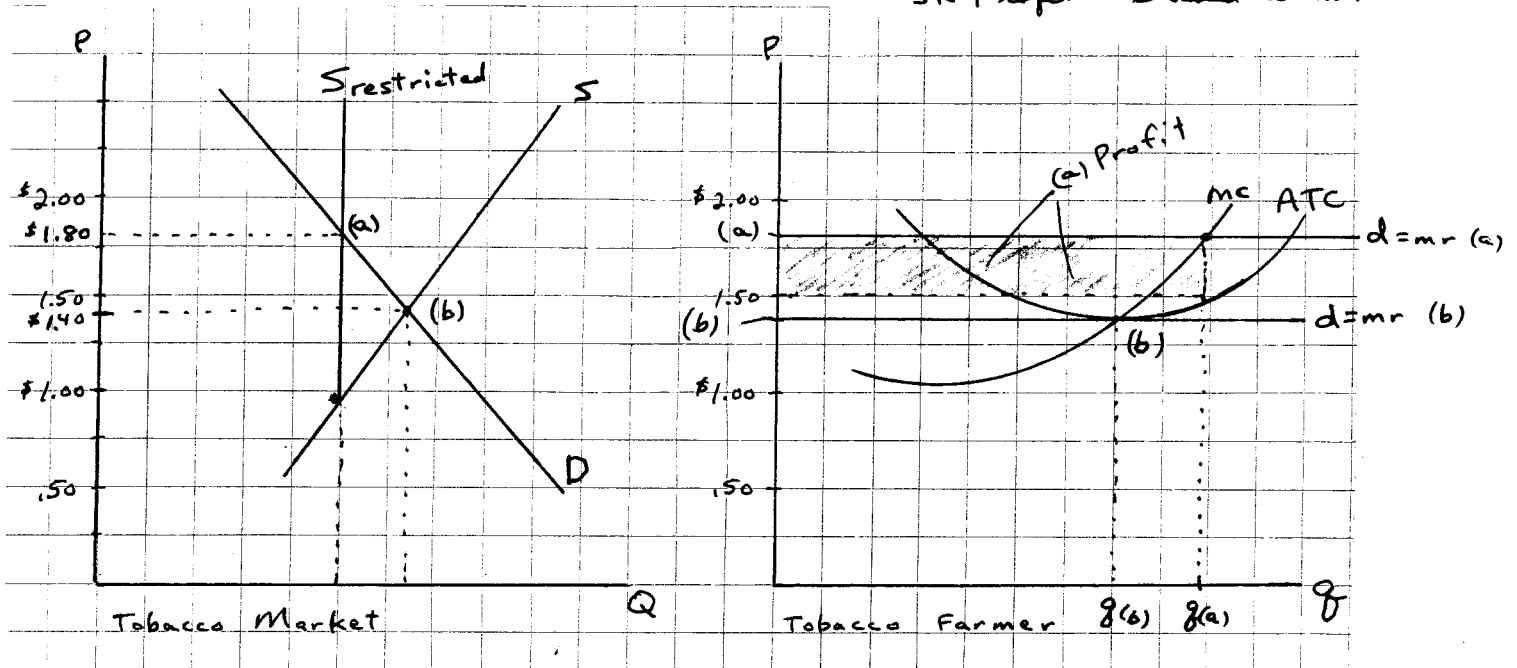
Q	TC	LR ATC
20	\$12	\$.60
60	\$24	\$.40
90	\$36	\$.40
100	\$48	\$.48

c) When the firm uses $L=2$ and $K=4$, it can produce $Q=20$. When it uses $L=18$ and $K=4$, it can produce $Q=90$. In the diagram above, illustrate three points on the firm's short-run average cost curve when it is constrained to use $K=4$. Again, show or briefly explain.

L = 2	K = 4	Q = 20	TC = \$16	ATC = \$.80
L = 6	K = 4	Q = 60	TC = \$24	ATC = \$.40
L = 18	K = 4	Q = 90	TC = \$48	ATC = \$.53

9. (25 pts.) Tobacco production in the United States has been governed by an allotment program that limits the amount of tobacco that can be produced and sold. This limitation on supply has resulted in a market price of tobacco equal to \$1.80 per pound. Agricultural economists estimate that the most efficient tobacco farmers can grow tobacco at an average cost of \$1.40 per pound. (a) Illustrate these current conditions in the diagrams below. You should sketch the ATC and MC curves for one of these efficient farmers, and show their profits in your diagram when market price is \$1.80 per pound.

produce $q(a)$ when $P = \$1.80$.
 SR Profit = shaded area.



(b) Now let's evaluate changes that are about to occur in the tobacco market. The government is eliminating the tobacco allotment program, so that entry into the industry will be unrestricted. How will the market be affected by this change? What will happen to the profits currently being earned by existing farmers? The number of tobacco farmers? The price of tobacco? Illustrate the eventual long-run equilibrium in the industry in your diagrams.

The profits being earned by existing tobacco farmers will attract new firms into the industry. The increase in supply will cause the market price of tobacco to fall. As price falls the profits currently being earned by tobacco farmers will disappear. We expect price to eventually fall to \$1.40 per pound, so that tobacco farmers earn zero economic profit.