

Multiple choice: 4 pts. each, circle correct answer.

1. Which of the following best fits the definition of a perfectly competitive market?
a) personal computers.
B ☒ b) lettuce.
c) cable TV.
d) retail clothing stores.
2. Situation A: $P=\$5$, $AFC=\$2$, $AVC=\$7$; Situation B: $P=\$7$, $AFC=\$9$, $AVC=\$5$.
The firm should:
a) shut down in both situation A and situation B
B ☒ b) shut down in situation A but produce in situation B
c) produce in situation A but shut down in situation B
d) produce in both situation A and situation B
3. In raising alligators, you find that in the short run your revenues and costs vary with output in the following manner:

Quantity	48	49	50	51	52	53	54	55	56
Total Revenue	\$9600	\$9800	\$10000	\$10200	\$10400	\$10600	\$10800	\$11000	\$11200
Marginal Cost	\$150	\$160	\$170	\$185	\$200	\$220	\$245	\$275	\$310

- What output should you produce if your goal is to maximize short-run profits?
C a) 48
☒ c) 52
b) 50
d) 54
4. The reason why we can be confident that the short-run market supply curve in a perfectly competitive industry slopes upward to the right is:
B ☒ b) because of the law of diminishing marginal returns.
a) because of the law of eventually diminishing marginal utility.
c) because it is a horizontal summation, not a vertical summation.
d) because of entry and exit of firms from the industry.
5. A firm produces 120 units of output at an average cost of \$2.00 per unit and 130 units at an average cost of \$2.10 per unit.
D a) Total variable cost must be equal to \$273
b) Marginal cost per unit is \$0.10
c) Marginal cost per unit is \$43
☒ d) Marginal cost per unit is \$3.30
e) Marginal cost per unit is \$10

6. (10 pts.) Crude oil is carried by pipelines from oil fields and storage areas over hundreds of miles to urban and industrial centers. The output of such pipelines is the amount of oil carried per day, and the two principal inputs are the diameter of the pipeline and the horsepower applied to the oil carried. It has been estimated that the production function for a pipeline with a 15-inch diameter is: $Q = 395H^{.29}$, where Q is the amount of crude oil carried per day and H is horsepower.
- Derive a formula for the marginal product of horsepower.
 - Do increases in horsepower result in diminishing marginal returns?

$$(a) \quad Q = 395 H^{.29}$$

$$MP_H = \frac{dQ}{dH} = 114.55 H^{-.71}$$

$$(b) \quad \frac{d MP_H}{d H} = -81.33 H^{-1.71} < 0, \text{ so yes.}$$

alternatively:

$$MP_H (\text{if } H=10) = 22.3$$

$$MP_H (\text{if } H=11) = 20.9$$

so MP_H is declining as H increases.

7. (10 pts.) You use fertilizer and pesticide to produce tobacco. At your current rates of usage, another bag of fertilizer per acre would increase output by ten pounds per acre. Another gallon of pesticide would increase tobacco output by 15 pounds. The price of fertilizer is \$7.50 per bag, and the price of pesticide is \$5 per gallon. Are you using the cost-minimizing combination of fertilizer and pesticide? If not, should you use relatively more fertilizer or relatively more pesticide? Briefly explain why.

Cost minimization requires that $\frac{MP_F}{MP_P} = \frac{P_F}{P_P}$

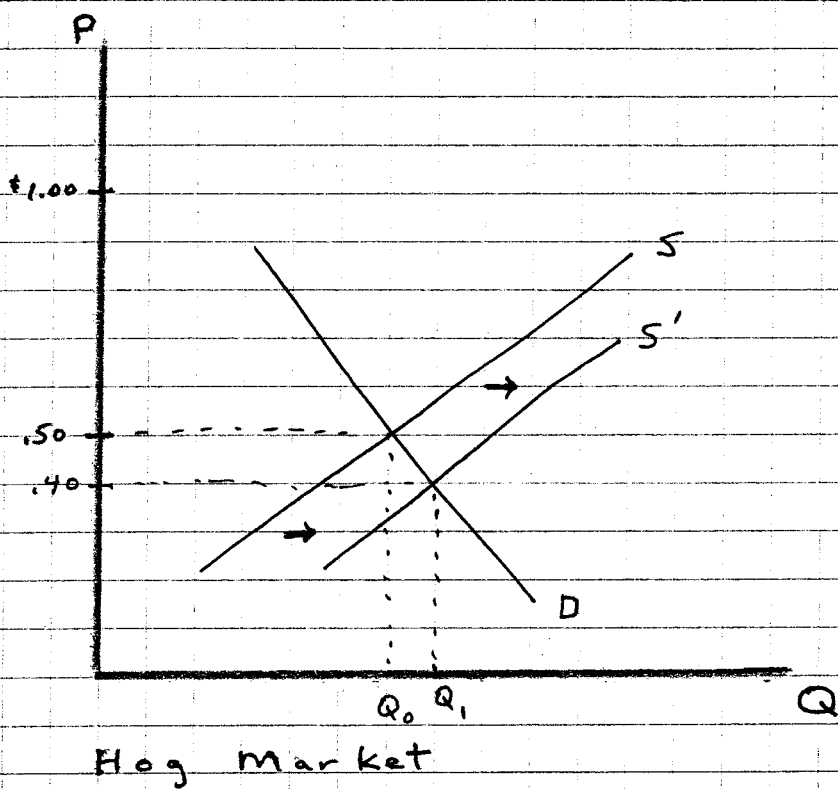
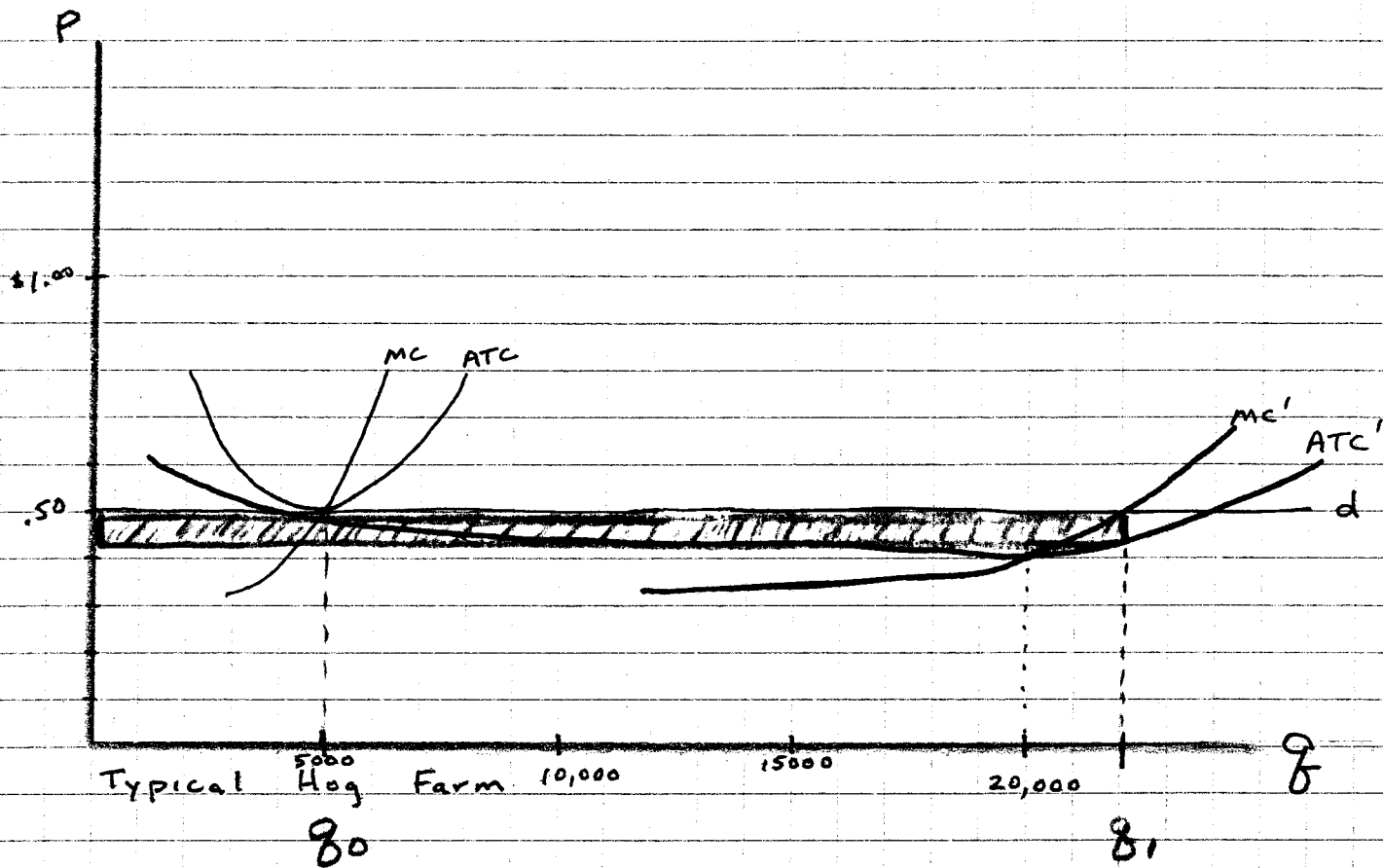
does $\frac{10}{15} \stackrel{?}{=} \frac{7.50}{5.00} \stackrel{?}{}$

.67 \neq 1.5 so we are not minimizing cost. We should use relatively more pesticide and less fertilizer to minimize cost. \$5 more spent on pesticide results in 15 pounds more tobacco. \$7.50 more spent on fertilizer only results in 10 pounds more tobacco.

8. (25 pts.) When you go back home to western Kentucky for the holidays, your cousins have a number of questions for you. They know that you are studying economics, and they want to ask some questions about their family business, raising hogs. The industry is currently in long-run equilibrium, with hogs selling for \$.50 per pound at the slaughterhouse. Your cousins use the same technology to produce hogs that everyone else uses—small family-owned farms, outdoor pens, mud, and slop. A typical hog farm produces 5,000 hogs per year. There are no locational advantages, and farmers from Mississippi to Minnesota can produce hogs at the same level of cost.

- a) Illustrate the initial long-run equilibrium using the diagrams for a typical firm and for the hog market on the attached sheet.
- b) One of your cousins shows you an article in the current issue of *Progressive Farmer* magazine. Some hog producers are experimenting with new production methods that use mass production techniques. These new “factory farms” are four times as big and can produce hogs at 20% lower cost than existing family-owned farms. Your cousin wants to know, what does the future hold for the hog industry? Provide her with an analysis, telling her what will happen in the long run to the price of hogs, market output, the number of hog farms, output of a typical firm, and profits. Use the diagrams to illustrate your answer.

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- (a) See diagram. Market supply and demand intersect at a price of \$.50 per pound. Market output is Q_0 . The typical firm produces 5000 hogs (q_0) per year at that price, and earns zero economic profit.
 - (b) See diagram. The ATC curve of a hog farmer who adopts the new technology reaches its minimum at an output of 20,000 hogs per year. ATC at that output is \$.40 per pound. The new average and marginal cost curves are labeled ATC' and MC'.
Hog farmers who adopt the new technology first can earn positive economic profits in the short run. The profit-maximizing output occurs where MC' intersects the firm's demand curve labeled d. Profits are the shaded area. As more and more firms adopt the new technology, market supply shifts to the right, and is labeled S'. Price will eventually fall to \$.40 per pound, which reflects the lower cost of producing pork. Market output will increase to Q_1 , as consumers demand more pork at the lower price. Even though market output increases, the number of hog farmers will likely fall, because each farm will produce four times as many hogs (20,000 per year vs. 5,000) as before. While early adopters earn short-run economic profits, **expected long-run profits are zero** in this market because entry barriers are insignificant.



9. (15 pts.) On the other side of your professor's family tree, brother-in-law Bubba owns a restaurant/bar in Fort Walton Beach, Florida, which he manages himself. On a recent visit Bubba shared the following information:

Income Statement for Bubba's Bar			
<u>Costs</u>		<u>Revenues</u>	
Wholesale cost of food and beer	\$40,000	Sales of food and drinks	\$130,000
\$100,000			
Wages and salaries	\$50,000		
(including \$20,000) for himself			
taxes, utilities, and insurance	\$12,000		
interest paid on bank loans			
\$100,000 @ 10%	\$10,000		

Bubba has \$50,000 of his own money invested in the bar. He anticipates that business will continue like this for the foreseeable future. Bubba also has a standing offer of \$30,000 to manage another bar in Fort Walton Beach. Suppose a national restaurant/bar chain offers Bubba \$150,000 to sell his bar, which would enable him to pay back the \$100,000 bank loan and recoup his own \$50,000. Should he take the offer? (Hint: what are Bubba's economic profits?)

Explicit Costs: \$112,000

Implicit Costs:	Bubba's time	\$10,000
	(30,000 - 20,000)	
	interest foregone	\$5,000
	(\$50,000 @ 10%)	
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		\$15,000

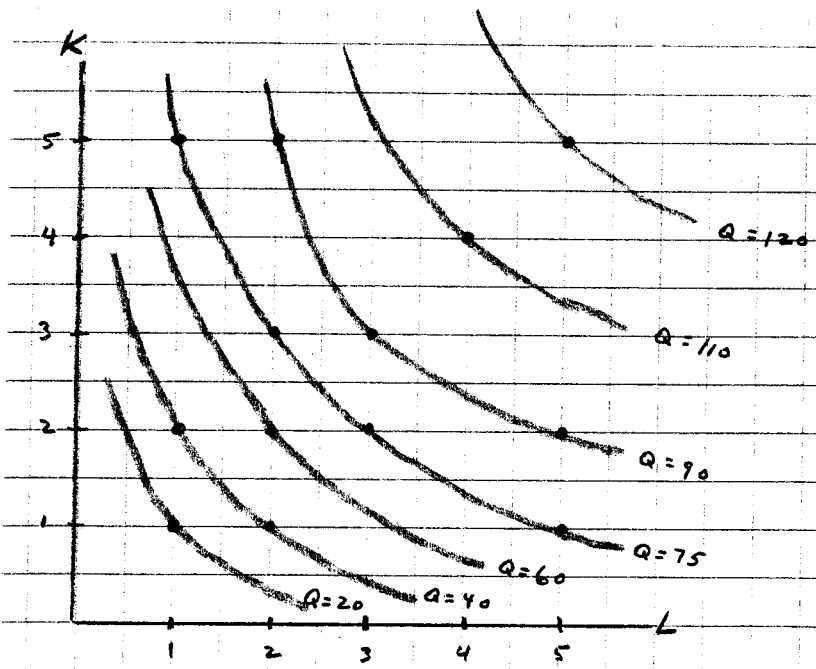
Total Economic Cost = \$127,000

so Bubba is earning \$3000 per year economic profit.
He should turn down the offer — it is not enough!

10. (20 pts.) Labor and capital are used to produce widgets according to the production table below:

	Labor Input					
Capital Input		1	2	3	4	5
	1	20	40	55	65	75
	2	40	60	75	85	90
	3	55	75	90	100	105
	4	65	85	100	110	115
	5	75	90	105	115	120

- a) While you do not have enough information to locate more than a couple of points on each isoquant, sketch this firm's isoquant map. Show the isoquants corresponding to outputs of 20, 40, 60, 75, 90, 110, and 120.
- b) Suppose that the firm's expansion path is the 45-degree line when $w = \$10$ and $r = \$10$. In other words, it minimizes cost by using labor and capital in equal proportions when input prices are equal. Draw the firm's LRAC curve in the attached diagram.



<u>L</u>	<u>K</u>	<u>Q</u>	<u>TC</u>	<u>ATC</u>
1	1	20	\$20	\$1.00
2	2	60	\$40	\$.67
3	3	90	\$60	\$.67
4	4	110	\$80	\$.73
5	5	120	\$100	\$.83

