Economics 101
Spring 2001
Section 4 - Hallam
Exam 4 Bonus

1. We say that a firm experiences *economies of scale* or increasing returns to size when ...

2. What is the shutdown rule for a firm in the short-run?

3. What are the conditions for a firm to minimize cost?

4. Complete the following statements about marginal and total product.

   a. When marginal product is negative, total product is _____.

   b. When marginal product is positive but falling, total product is _____.

   c. When marginal product is rising, total product is _____.

   d. When average product is rising, marginal product is _____.

   e. When average product is at its maximum point, marginal product is _____.

5. Complete the following about income and substitution effects.

   a. The substitution effect of a price change is the _____.

   b. The income effect of a price change is the _____.

   c. What can we say about the sign of the income effect of a price change?

   d. What can we say about the sign of the substitution effect of a price change?

6. Consider the following data on cocoa and lumber in Norway and Ghana where the data is production per time period. Assume that the production possibility frontier is linear. With no cocoa production, Norway can produce 90,000 board feet of lumber. With 3,000 kilograms of cocoa, Norway has no lumber production, etc.

	Cocoa	Lumber
Norway	0	90,000
Norway	3,000	0
Ghana	0	50,000
Ghana	2,500	0

a. Who has the absolute advantage in cocoa production?

b. Who has the comparative advantage in lumber production?

	Cocoa	Lumber
Norway	lumber	cocoa
Ghana	lumber	cocoa

c. If each country produced 1,000 kilograms of cocoa and then each used their remaining resources for lumber production, what would total lumber production be?

d. If Norway produced 500 kilograms of cocoa and Ghana produced 1,500 kilogram of cocoa, and each used their remaining resources for lumber production, what would total lumber production be?

7. Use the following table for this question. The table shows data for a specific firm. Y denotes output, FC denotes fixed cost, VC denotes variable cost, TC represents total cost, AFC is average fixed cost, AVC is average variable cost, ATC is average total cost, and MC is marginal cost. TR is total revenue, and MR is marginal revenue.

Y	FC	VC	TC	AFC	AVC	ATC	MC	Price	TR	MR
0.00	250.00	0.00	250.00				50.00	105	0	105
1.00	250.00	46.00	296.00	250.00	46.00	296.00	43.00	102	102	99
2.00	250.00	88.00	338.00	125.00	44.00	169.00	42.00	99	198	93
3.00	250.00	132.00	382.00	83.33	44.00	127.33	47.00	96	288	87
4.00	250.00	184.00	434.00	62.50	46.00	108.50	58.00	93	372	81
5.00	250.00	250.00	500.00	50.00	50.00	100.00	75.00	90	450	75
6.00	250.00	336.00	586.00	41.67	56.00	97.67	98.00	87	522	69
7.00	250.00	448.00	698.00	35.71	64.00	99.71	127.00	84	588	63
8.00	250.00	592.00	842.00	31.25	74.00	105.25	162.00	81	648	57
9.00	250.00	774.00	1024.00	27.78	86.00	113.78	203.00	78	702	51
10.00	250.00	1000.00	1250.00	25.00	100.00	125.00	250.00	75	750	45

a. If this firm is a price setter, how much should it produce in the short run?

b. If this firm is a price setter, how much should it produce in the long run?

c. If $100 of the fixed cost is sunk ($150 is avoidable), how much should the firm produce in the short run?

d. If $25 of the fixed cost is sunk ($225 is avoidable), how much should the firm produce in the short run?

8. The following table is for use with this question. The underlying production function is

$$y = 40x_1 + 10x_2 - x_1^2 + x_1x_2 - 2x_2^2$$

The price of x_1 is \$100 and the price of x_2 is \$20. The price of the output of the firm is \$5. The prices of inputs are given by w_1 and w_2. MC is the marginal cost of output. APP_i is the average physical product of the ith input while MPP_i is the marginal physical product of the ith input.

x_1	x_2	w_1	w_2	Output	Cost	MC	APP_1	APP_2	MPP_1	MPP_2
7	4	100	20	287	780	3.333			30	6
7	5	100	20	291	800	3.357	41.571	58.200	31	2
7	6	100	20	291	820	3.357	41.571	48.500	32	-2
9	5	100	20	349	1000	3.763	38.778	69.800	27	4
10	5	100	20	375	1100	4.000			25	5
11	5	100	20	399	1200	4.264	36.273	79.800	23	6
13	6	100	20	447	1420	5.000	34.385	74.500	20	4
13	7	100	20	449	1440	5.040	34.538	64.143	21	0
13	8	100	20	447	1460	5.000	34.385	55.875	22	-4
14	7	100	20	469	1540	5.494	33.500	67.000	19	1
15	7	100	20	487	1640	6.030	32.467	69.571	17	2
16	7	100	20	503	1740	6.667	31.438	71.857	15	3
22	9	100	20	567	2380	20.000			5	1
20	9	100	20	553	2180	12.060	27.650	61.444	9	-1
22	8	100	20	564	2360	17.056	25.636	70.500	4	5

a. What is the average product of x_2 when $x_1 = 10$ and $x_2 = 5$?

b. What is the average product of x_1 when $x_1 = 7$ and $x_2 = 4$?

c. What is the least cost way to produce 287 units of output?

d. Is the least cost way to produce 291 units of output contained in the table? If so, what are the input levels?

e. Is the least cost way to produce 447 units of output contained in the table? If so, what are the input levels?

f. How could one show the result in part e without using the cost column or computing the cost directly?

g. What is the slope of the isoquant for y = 447 when $x_1 = 13$ and $x_2 = 8$?

h. What is the profit maximizing level of output?

i. What would be the least cost way to produce 375 units of output if $w_1 = 50$ and $w_2 = 10$?

9. Consider the the following perfectly competitive industry which produces dress shirts. The market demand in the industry is given by a linear demand function $Q^D = 400 - 2P$ where Q^D is the demand for dress shirts. The inverse demand is $P = 200 - \frac{1}{2} Q$. There are ***16*** identical manufacturers of dress shirts. Each manufacturer has the same production costs and there is only one size of plant for all firms. The long-run total and marginal cost functions are:

   $TC(q) = 100 + 10q + q^2$
   $MC(q) = 10 + 2q$.

   a. What is the supply equation for a firm in the industry?

   b. What will be the industry supply function?

   c. What will be the equilibrium price in this industry?

   d. How much will ***each*** firm produce?

   e. What will be the profits of each firm?

      π = R - Total Cost = $pq - [100 + 10q + q^2]$ =

   f. Will firms want to enter this industry?

   g. What will be the industry supply function if there are 72 firms in the industry?

   h. What will be the equilibrium price in this industry?

   i. How much will ***each*** firm produce?

j. What will be the profits of each firm?

k. Will firms want to enter this industry?

l. What can you say about the number of firms which will be in this industry in the long run?

The number of firms is greater than _____ and less than _____>

m. What will be the industry supply function if there are 34 firms in the industry?

n. What will be the equilibrium price in this industry?

o. How much will ***each*** firm produce?

p. What will be the profits of each firm?

q. Will firms want to enter this industry?

10. Consider a firm with the following cost function.

$$cost(y) = 32 + 8y + 0.5y^2$$

Assume that in the long run, all costs are avoidable. Marginal cost is given by

$$MC(y) = 8 + y$$

Average cost reaches its minimum at the point where it is equal to marginal cost. In the short run $24 of the fixed costs are sunk, so $8 of the fixed costs are avoidable. Average avoidable cost also reaches its minimum at the point where it is equal to marginal cost.

a. From a long-run perspective, what is the level of y at which average cost is minimized.

b. From a long-run perspective, what is the level of average cost when it is minimized.

c. From a short-run perspective, what is the level of y at which average avoidable cost is minimized.

d. From a short-run perspective, what is the level of average avoidable cost when it is minimized.

e. What is this firm's long-run supply function? (It will have two parts.)

f. What is this firm's short-run supply function? (It will have two parts.)

11. Consider a firm with the following cost function.

$$cost(y) = 16 + 10y + y^2$$

Assume that in the long run, all costs are avoidable. Marginal cost is given by

$$MC(y) = 10 + 2y$$

In the short run $7 of the fixed costs are sunk, so $9 of the fixed costs are avoidable. Average avoidable cost reaches its minimum at the point where it is equal to marginal cost.

a. From a long-run perspective, what is the level of y at which average cost is minimized.

b. From a long-run perspective, what is the level of average cost when it is minimized.

c. From a short-run perspective, what is the level of y at which average avoidable cost is minimized.

d. From a short-run perspective, what is the level of average avoidable cost when it is minimized.

e. What is this firm's long-run supply function? (It will have two parts.)

f. What is this firm's short-run supply function? (It will have two parts.)

12. What is the long run supply function for an industry made up of the firms in questions 10 and 11?

13. What is the short run supply function for an industry made up of the firms in questions 10 and 11?

14. Now consider the short run equilibrium in this market. Assume that industry demand is given by $Q^D = 27 - p$.

    a. What is the short run equilibrium price in this market?

    b. How much will ***each*** firm produce?

    c. What are the Returns minus avoidable costs of ***each*** firm?

    ROAvdC (Firm 1) = R_1 - Avoidable $Cost_1 = py_1 - [\ 8 + 8y_1 + 0.5y_1^2\ ] =$

    ROAvdC (Firm 2) =

    d. Will both firms stay in the market in the short run?

15. Now consider the long run equilibrium in this market. Assume that industry demand is given by $Q^D = 27 - p$.

a. What is the long run equilibrium price in this market if both firms continue to produce? (Answer is the same as 14a)

b. How much will each firm produce? (Answer is the same as 14b)

c. What are the profits of ***each*** firm?

$\pi_1 = R_1 - \text{Total Cost}_1 = py_1 - [\ 32 + 8y_1 + 0.5y_1^2\ ] =$

d. Will both firms stay in the market in the long run?

e. Find the competitive equilibrium market price by setting the supply equation for this firm equal to the market demand equation.

f. How much will this firm produce?

g. What will be the profits of the firm?

h. What is inverse demand for this market?

i. If the firm acts like a monopolist and sets marginal cost equal to marginal revenue how much will it produce?

j. What will be the market price?

k. What will be the profits of the firm?