

Econ 532  
 In Class Exam (36 pts.)  
 Deiter  
 SS'08

Name Key

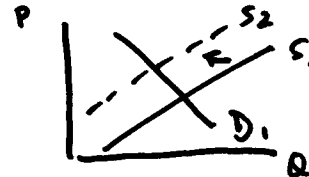
Thought: Again, this is an Econ test, not a Stat test. Therefore, precise answers are preferred over estimates.

Instructions: Answer any 4 of the following 6 questions. Each question is worth 9 pts. and the pts. are equally distributed across any sub parts to each question. Missed pts. will be deducted from a maximum possible score of 36, so it is in our best interest to leave two questions blank (no penalty). Good luck.

1. Management of an ethanol producing firm is attempting to predict the impact on U.S. corn prices of this year's flooding in Iowa. Assumptions made by management include (1) Iowa produces 20% of the U.S. corn crop, (2) planted corn acres in Iowa are down 4% due to the flooding prior to planting, (3) an additional 4% of planted acres will not be harvested due to flooding after planting and (4) no other production changes are anticipated inside or outside of Iowa.

- a. Explain/describe the graphical market supply and/or demand curve effect of corn production problems due to flooding.

Shift to left  
 of corn supply curve.



- b. Based on the assumptions above, what is your estimated % reduction in U.S. corn production due to flooding in Iowa?

⇒ 8% ↓ in Iowa corn acres planted (= ↓4%) and harvested (= ↓4%)  
 = 8% × .2 = 1.6% ↓ U.S.

- c. If the own price elasticity of demand for U.S. corn is -.25, and using your answer to b) above, what is your predicted change in the U.S. corn price due to flooding in Iowa?

$$E_D = \frac{\% \Delta Q}{\% \Delta P} \Rightarrow -.25 = \frac{-1.6}{\% \Delta P}$$

$$\Rightarrow \% \Delta P = \frac{-1.6}{-.25} = +6.4\% \Delta P$$

2. Assume West Liberty Foods produces <sup>5</sup> boxes of turkey breasts that the company sells in two markets – Eastern U.S. (= E) and Western U.S. (= W).

Information to management includes:

$$\begin{aligned} D_E: & P_E = 80 - .4Q \\ MR_E &= 80 - .8Q \\ MC_E &= 34 \end{aligned}$$

$$\begin{aligned} D_W: & P_W = 60 - .3Q \\ MR_W &= 60 - .6Q \\ MC_W &= 24 \end{aligned}$$

Where:

P	=	price per box
Q	=	quantity units per week
MR	=	marginal revenue
MC	=	marginal cost
TR	=	total revenue

- a) If West Liberty Foods practices price discrimination,
- (1) what price should the company charge in each market to maximize total company profits and
  - (2) what is the company's TR in both markets combined?

$$\begin{aligned} (1) \quad MR_E = MC_E &\Rightarrow 80 - .8Q = 34 \Rightarrow .8Q = 46 \Rightarrow Q_E = 57.5 \\ &\Rightarrow P_E = 80 - .4(57.5) = 57 = P_E \\ &\Rightarrow TR_E = (57.5)(57) = 3277.50 \end{aligned}$$

$$\begin{aligned} MR_W = MC_W &\Rightarrow 60 - .6Q = 24 \Rightarrow .6Q = 36 \Rightarrow Q_W = 60 \\ (2) \quad TR &= 3277.5 + 2520 = 5797.50 = TR_E + TR_W \\ &\Rightarrow P_W = 60 - .3(60) = 42 = P_W \\ &\Rightarrow TR_W = (60)(42) = 2520 \end{aligned}$$

- b) If the MC of producing and selling a box of turkey product in each market were the same, say  $MC = 32$ , should the company then also charge the same price in each market? Explain why you agree or disagree.

Disagree, because demand in each market is still different.

$$\begin{aligned} MR_E = MC_E &\Rightarrow 80 - .8Q = 32 \Rightarrow .8Q = 48 \Rightarrow Q_E = 60 \\ &\Rightarrow P_E = 80 - .4(60) = 56 \end{aligned}$$

$$MR_W = MC_W \Rightarrow 60 - .6Q = 32 \Rightarrow .6Q = 28 \Rightarrow Q_W = 46.67$$

$$\Rightarrow \text{However, IF } MC = 32, \text{ agree in this specific case.} \quad \Rightarrow P_W = 60 - .3(46.67) = 56$$

- c) What is the company's maximum TR in both markets combined if it sells  $Q = 75$  in each market?

$$TR_E = (80 - .4(75))(75) = (50)(75) = 3750$$

$$TR_W = [60 - .3(75)](75) = (37.50)(75) = 2812.50$$

$$\underline{6562.50 = TR_E + TR_W}$$

3. Assume an individual owns and operates their own house painting business, Pro Painters, and the firm's only inputs are units or hours of labor provided by Mr. Latex ( $= H_L$ ) and by Ms. Gloss ( $= H_G$ ).

a) If  $Q = .10H_L + .20H_G$  where  $Q$  = number of houses painted. To paint 3 houses, how many units of:

(1)  $H_L$  are needed if  $H_G = 0$ ? (i.e. painted by Mr. Latex alone)

$$\begin{aligned} \Rightarrow 3 &= .10H_L + .20(0) \\ \Rightarrow .10H_L &= 3 \quad \Rightarrow H_L = 30 \end{aligned}$$

(2)  $H_G$  are needed if  $H_L = 0$ ? (i.e. painted by Ms. Gloss alone)

$$\begin{aligned} \Rightarrow 3 &= .10(0) + .20(H_G) \\ \Rightarrow .20H_G &= 3 \quad \Rightarrow H_G = 15 \end{aligned}$$

(3)  $H_L$  and  $H_G$  are needed if  $H_G = H_L$  (i.e. painted by the two painters working together)

$$\begin{aligned} \Rightarrow 3 &= .10H_L + .20H_L \quad (\text{as } H_L = H_G) \\ \Rightarrow .30H_L &= 3 \quad \Rightarrow H_L (= H_G) = 10 \end{aligned}$$

b) If the marginal product per day of all painters hired by Pro Painters is the same and is given by  $MP = .5 - .05H$  ( $H$  = units or hours of labor per day),  $MFC = 10$  (= wage rate paid to each unit of labor), and  $P = 100$  (the price Pro Painters is able to charge and receive from its customers for each unit of  $H \Rightarrow MRP = (P \times MP) = 50 - 5H$ , where  $MRP$  = marginal revenue product, what is the profit-maximizing number of hours ( $H$ ) for employment of each painter per day?

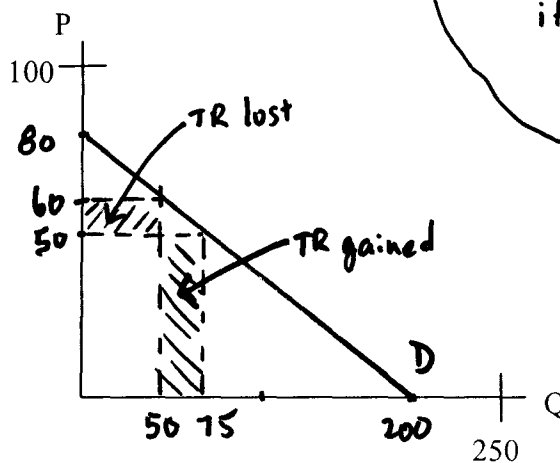
$$\begin{aligned} \Rightarrow MRP &= MFC \\ \Rightarrow 50 - 5H &= 10 \\ \Rightarrow 5H &= 40 \quad \Rightarrow H = 8 \end{aligned}$$

c) Given the production function equation in 3a), what is the equation of the  $Q = 10$  isoquant if  $H_L$  is the vertical axis variable (and the variable on the left side of the isoquant equation)?

$$\begin{aligned} \Rightarrow 10 &= .10H_L + .20H_G \\ \Rightarrow .10H_L &= 10 - .20H_G \\ \Rightarrow H_L &= 100 - 2H_G \end{aligned}$$

4. Suppose a company's demand curve is given by the equation  $P = 80 - .4Q$ .

a) Draw the firm's demand curve in a graph (Hint: identify axis intercepts and connect).



if  $Q = 0, P = 80$   
 if  $P = 0, Q = 200$   
 see graph

b) In this graph, identify (1) the P and Q points for  $P_1 = 60$  and  $P_2 = 50$ , (2) the revenue lost on the original Q, as a result of the firm lowering its price from 60 to 50 (label TR lost), and (3) the revenue gained on the extra Q sold as a result of the firm lowering its price from 60 to 50 (label TR gained). Hints:  $TR \text{ lost} = (P_1 - P_2)(Q_1)$  and  $TR \text{ gained} = (Q_2 - Q_1)(P_2)$  and these are areas of rectangles in your graph.

see graph

$$\begin{aligned} \text{if } P_1 = 60 &\Rightarrow Q_1 = 50 \Rightarrow TR_1 = 3000 \\ \text{if } P_2 = 50 &\Rightarrow Q_2 = 75 \Rightarrow TR_2 = 3750 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{if } P_1 = 60 \\ \text{if } P_2 = 50 \end{aligned}} \right\} +750$$

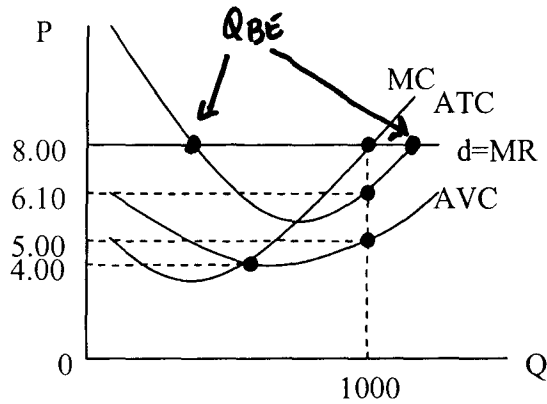
$$\begin{aligned} TR \text{ lost} &= (P_1 - P_2)Q_1 = (60 - 50)(50) = -500 \\ TR \text{ gained} &= (Q_2 - Q_1)P_2 = (75 - 50)(50) = +1250 \end{aligned} \quad \left. \vphantom{\begin{aligned} TR \text{ lost} \\ TR \text{ gained} \end{aligned}} \right\} +750$$

c) Calculate and compare TR's for this firm if it (1) charges a  $P = \$50$  for all Q it can sell and (2) it charges a  $P = \$60$  for all Q it can sell up to  $Q = 50$ , but implements a "quantity discount" price = \$40 for Q units purchased greater than 50.

$$TR \text{ (no \& discount)} \Rightarrow P \cdot Q = (50)(75) = \boxed{\$3750}$$

$$\begin{aligned} TR \text{ (w/ \& discount)} &\Rightarrow P_1 Q_1 + P_2(Q_2 - Q_1) \\ &\text{after } Q = 50 \\ &= (60)(50) + 40(100 - 50) \\ &= 3000 + 2000 = \boxed{\$5000} \end{aligned}$$

5. Assume the graph below contains economic information for a given firm. Refer to it to answer the questions below.



- a) Is this firm a price setter or a price taker?

↳ because of constant MR

- b) What is TFC for this firm?

$$TFC = AFC \cdot Q$$

$$= (ATC - AVC) \cdot Q = (6.10 - 5.00) (1000) = 1100$$

- c) What is maximum attainable profit for this firm?

$$\text{Max } \pi \Rightarrow MR = MC \text{ at } Q = 1000$$

$$= TR - TVC - TFC = P \cdot Q - AVC \cdot Q - AFC \cdot Q$$

$$= (8)(1000) - (5)(1000) - (1.10)(1000)$$

- d) At what price would this firm shut down in the short run? =  $8000 - 5000 - 1100 = 1900$

$$= \text{Min } AVC$$

$$= 4.00$$

- e) If price = \$8, identify the breakeven points in the graph (label  $Q_{BE}$ ).

See graph

- f) What is TVC at  $Q = 1000$ ?

$$= AVC \cdot Q = (5.00)(1000) = 5000$$

6. Assume a price-taking firm has short run:

$$\begin{aligned}TR_1 &= 100Q \\TC_1 &= 24,000 + 20Q \\ \text{Where } Q &= \text{units of output}\end{aligned}$$

- a) What is this firm's short run TFC?

$$\begin{aligned}&= \text{constant part of } TC \\ &= 24,000\end{aligned}$$

- b) What is the market price received by this firm for its output?

$$\begin{aligned}TR &= P \cdot Q = 100Q \\ \Rightarrow P &= 100\end{aligned}$$

- c) What is this firm's breakeven  $Q$ ?

$$\begin{aligned}\Rightarrow TR - TC &= 0 \\ \Rightarrow 100Q - 24,000 - 20Q &= 0 \\ \Rightarrow 80Q &= 24,000 \Rightarrow Q = 300\end{aligned}$$

- d) Assume the firm is initially selling  $Q_1 = 400$ . What is the firm's TR, TC, and profit at this point?

$$\begin{aligned}TR &= 100(400) = 40,000 \\ - TC &= 24,000 + 20(400) = 24,000 + 8,000 = 32,000 \\ \hline &= \pi = 8,000\end{aligned}$$

- e) What is this firm's MC?

$$\begin{aligned}&= \text{slope of } TC \\ &= (1)(20)Q^{1-1} = +20 = MC\end{aligned}$$

- f) Calculate the new level of  $Q$  (= output) that would be needed to produce the same profit as in d) above if the market price of the firm's output decreases so that  $TR_2 = 90Q$ ?

$$\begin{aligned}\text{new } \pi &= 8,000 \\ \Rightarrow 90Q - 24,000 - 20Q &= 8,000 \\ \Rightarrow 70Q &= 32,000 \\ \Rightarrow Q &\approx 457\end{aligned}$$



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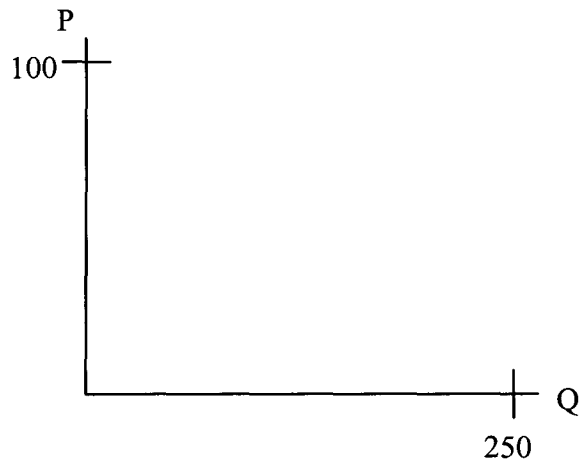
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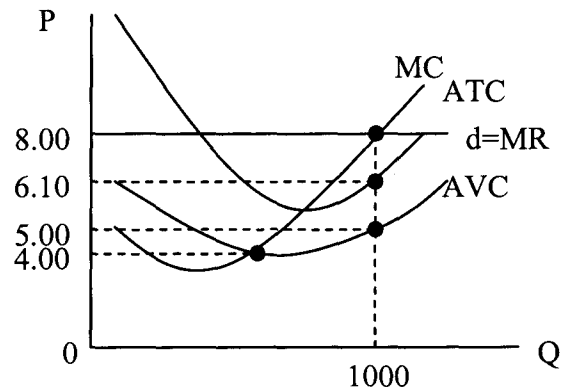
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- 
- What is this firm's MC?