

ECON 310  
Assignment #3 -- KEY

1. Chapter 7, Numerical Exercises N1, N2

- N1.
- a. Since firms will produce where  $P=MC$ , each firm will produce 5 units at a price of \$10. The firms will earn a profit of  $5 * \$10 - \$36 = \$14$ . The industry is not in the long-run, because the firms are making a positive economic profit.
- b. In the long-run there will be entry into this industry. The firms will earn zero profit and will produce where  $P=MC=ATC$ . This happens when  $q=3$  and  $p=6$ .

- N2.
- a. Since the industry is in long-run equilibrium,  $P=MC=ATC$ . This happens at  $P=\$15$ .
- b. At  $P=\$15$ , industry demand is 450 and each firm produces 3 units, so there are  $450/3 = 150$  firms.
- c. At  $P=\$10$ , each firm produces 2 units. Since there are 150 firms, the quantity  $150 * 2 = 300$  will correspond to a price of \$10.
2. Widgets are provided by a competitive constant-cost industry where each firm has fixed costs of \$30. The following chart shows the industry-wide demand curve and the marginal cost curve of a typical firm.

Industry Wide Demand		Firm's Marginal Cost Curve	
Price	Quantity	q	MC
\$5	1500	1	\$5
10	1200	2	10
15	900	3	15
20	600	4	20
25	300	5	25
30	200	6	30
35	140	7	35
40	50	8	40

- a. Assume the industry is at its long-run competitive equilibrium. What is the price of a widget?  
 $P=MC=ATC=\$20$
- b. How many firms are in the industry?  
At  $P=\$20$ , each firm produces 4 units ( $q$ ). Industry-wide demand is 600 ( $Q$ ). # firms =  $Q/q = 600/4 = 150$  firms

Suppose there is a SALES tax of \$15 per widget.

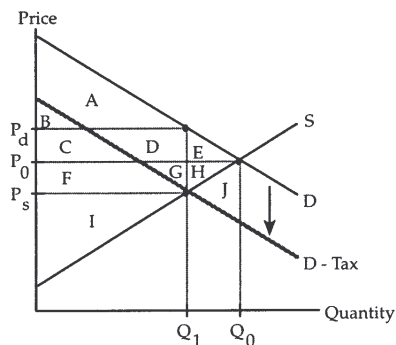
- c. In the short run, what is the new price of widgets?  
Need to put in industry supply curve: get this by multiplying 150 firms by  $q$  at each price. Change demand prices to reflect the tax- remember a sales tax lowers the corresponding price by the amount of the tax. So, lower each price by \$15. Now, find where new industry demand equals industry supply. This happens where  $p= \$10$  and  $Q= 300$ .
- d. In the short run, how many firms leave the industry?  
In the SR, the number of firms is fixed. So, no firms leave!
- e. In the long-run what is the new price of widgets?  
Our MC hasn't changed with sales tax. So, our original condition,  $P=MC=ATC=\$20$  must hold in any LR equilibrium. In LR, price goes back up to \$20.
- f. In the long-run, how many firms leave the industry?  
At a price of \$20, industry demand is now only 140. Each firm is producing 4 units. So, new  $Q/q = 140/4 = 35$  firms. Thus,  $150 - 35 = 115$  firms have left the industry in the LR.

3. The marginal revenue curve of a competitive firm is
- a. U-shaped.

- b. a ray from the origin.
  - c. **a horizontal line at the market price.**
  - d. downward sloping.
4. A firm will shut down in the short run if its revenues fail to cover its
- a. fixed costs.
  - b. **variable costs.**
  - c. total costs.
  - d. sunk costs.
5. A competitive firm will exit an industry in the long run when the market price falls below its
- a. marginal revenue.
  - b. marginal cost.
  - c. **average cost.**
  - d. average variable cost.
6. Suppose all firms in an industry are identical. In the long run, entry and exit guarantee that all firms will have zero
- a. marginal cost.
  - b. average cost.
  - c. **economic profit.**
  - d. accounting profit.

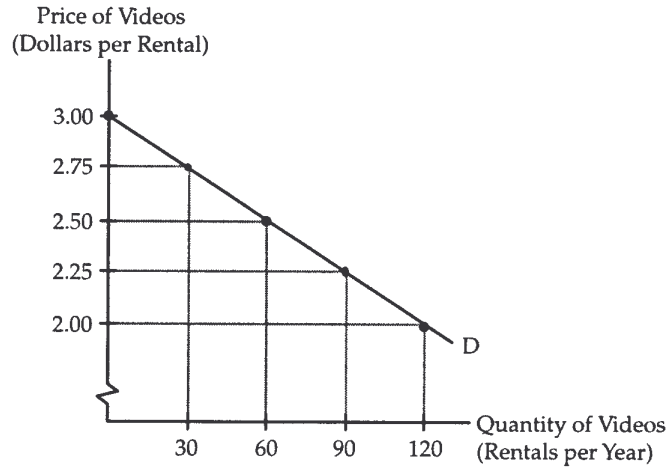
### Sales Tax

The following questions refer to the accompanying diagram which shows the effects of a sales tax imposed on consumers. The initial price and quantity are  $P_0$  and  $Q_0$ , respectively. After the tax is imposed, the equilibrium quantity is  $Q_1$ , firms receive the price  $P_s$ , and consumers pay the price  $P_d$ .



7. Refer to Sales Tax. After the tax is imposed, consumers' surplus is equal to AB.
8. Refer to Sales Tax. Area  $C + D + F + G$
- a. the total value that consumers receive from their purchases.
  - b. **the tax revenue collected by the government.**
  - c. the fall in producers' surplus.
  - d. the deadweight loss due to the tax.
9. Refer to Sales Tax. After the tax is imposed, social gain is equal to BCDFGI.
10. Refer to Sales Tax. After the tax is imposed, the deadweight loss is equal to EH.
11. Prior to the sales tax, which of the following was false?
- a. Consumer surplus was  $A+B+C+D+E$ .
  - b. **Producer surplus was  $F+G+H+I+J$ . (NO J!)**
  - c. Government tax revenue was zero.
  - d. Dead-weight loss was zero.

12. The diagram below shows Shontel's annual demand for videos. Shontel currently rents videos from Blockpopper's, which charges \$2.50 per rental.



- (i) How many videos does Shontel rent each year? How much consumer's surplus does Shontel receive from renting videos?
- (ii) Blockpopper's starts a "frequent viewers" club. For a membership fee of \$35 per year, club members can rent as many videos as they wish at the discounted price of \$2 per rental. Should Shontel join the "frequent viewers" club? If yes, how much surplus value would Shontel receive as a club member? If no, what membership fee would Shontel be willing to pay to join the club?

ANS:

- (i) Shontel rents 60 videos each year. Shontel receives \$15 in consumer's surplus ( $1/2 \times 60 \text{ rentals} \times \$0.50 \text{ per rental}$ ).
- (ii) Shontel would rent 120 videos per year at the discounted price of \$2 per rental. Without the membership fee, Shontel would receive \$60 in consumer's surplus ( $1/2 \times 120 \text{ rentals} \times \$1.00 \text{ per rental}$ ). Paying the \$35 annual membership fee leaves Shontel with \$25 of surplus value. Yes, Shontel should join the "frequent viewers" club because doing so adds an additional \$10 of surplus value.