



15.010 / 15.011 Economics Analysis For Business Decisions

HOMEWORK SET #3

(Due Friday, October 8th, 2004)

Name: _____

Section: _____

**Please staple this sheet to the front of your answer set.
Do NOT write you're answers on this sheet.**



HOMework SET #3

(Due Friday, October 8th, 2004)

DIRECTIONS: Answer all questions and show your work. Your completed homework may be placed in the assignment box for your section before 4:30 p.m. *Late homework sets will not be corrected.* Please read the statement on 15.010/15.011 homework policy contained in the course overview.

1. Decide whether each of the following three statements is **True**, **False**, or **Uncertain**, and give a brief but clear explanation why.
 - a) The demand for durable goods is more elastic in the long run because even if prices decrease, consumers may not have enough money to buy the goods immediately.
 - b) Your company lost a court case and has to pay \$20 for every snowmobile it produces. The verdict cannot be overturned. That implies that this is a sunk cost and should not play a role in further decision making.
 - c) Your company produces laptop computers for corporate customers who demand fixed quantity each year but are willing to pay more for higher quality machines. Prices for laptops are described by the following hedonic price equation:
$$\ln P = 7 + .35 \ln(D) + .3 \ln(B) - .25 \ln(W),$$
where P is price in dollars, D is the size of hard disk in gigabytes, B is the battery life in hours, and W is the weight of the laptop in pounds. Your current product has a 10Gb hard disk, battery life of 2 hours, and a weight of 5 pounds. It sells for \$2000.
If you modify the laptop to include an improved battery, the battery life would increase to 3 hours, but the weight would also increase to 6 pounds. The new battery costs an additional \$300. You should sell the laptop with the new battery. (You do not need to use logarithms to solve this problem)
 - d) A firm with seller market power will never choose a level of output (and price) that yields negative marginal revenue in any period, even in the presence of positive network externalities for its product.
 - e) A window manufacturer operates in a competitive market, where the price of a window is \$50. The firm has two plants, one in Pittsburgh, the other in Boston. For each output level, the Boston plant has lower marginal costs (e.g. the marginal cost of the first unit in Boston is \$10 and it is \$15 in Pittsburgh, while the marginal cost of the 100th unit is \$30 in Boston and \$40 in Pittsburgh). Given these lower costs, the firm should only produce in Boston.
2. Managers at a machine tool manufacturer, McTools Inc., have estimated the following learning curve for the production of a new air conditioner where labor input is measured in minutes. Let N denote cumulative lot number and S mean lot size. Then

$$\ln(\text{labor input per air conditioner in } N^{\text{th}} \text{ lot}) = 8.0 - 0.9 \ln(N) - 0.4 \ln(S)$$

- a) Suppose managers at McTools Inc., decide to increase the lot size by 5%, what happens (approximately) to the labor input per air conditioner?
- b) If the air conditioners are manufactured 100 in each lot, how much labor is required to produce the first lot?
- c) Suppose 1000 air conditioners are produced in four lots, each of size 250. Compute the labor input required for each lot and then the total labor input required for 1000 air conditioners *and* the overall average labor input per air conditioner. It may help to create a table in Excel like the following:

Cumulative Lot Number, N	Lot Size, S	Labor Input in N th lot
1	250	
2	250	
3	250	
4	250	

Total Labor Input required to produce 1000 air conditioners =

Average Labor Input per air conditioner (over the full 1000) =

- d) What would the overall average labor input per air conditioner be if you organized production of 1000 air conditioners into one lot of size 1000? Two lots of size 500? Which of these three production plans (4 lots of 250, 2 lots of 500 or 1 lot of 1000) provides the lowest overall average labor input cost when producing 1000 air conditioners?
3. Suppose your firm is thinking about producing televisions next period. The price of a TV is \$100 and the marginal cost is \$80 for each TV produced up to a capacity of 10,000 units. However, in order to produce next period, a fixed development cost of \$185,000 must be paid this period.

Be sure to show your calculations:

- a) With a discount rate of 0.05 would you take on the project? What if your discount rate were 0.1?
- b) Now suppose that you expect to produce 10,000 units in each of the next three periods. In order for the development to last for the next three years, the fixed development cost this period increases to \$450,000. With a discount rate of 0.05, would you take on the project? With a discount rate of 0.1?
- c) Now return to the setting of part a, except that the price is not known this period. Instead, at the before starting production next period you will learn that the price is either \$100 with probability 0.9 or \$70 with probability 0.1. Calculate the expected present value of the project with a discount rate of 0.05. Would you take on the project in this environment?
- d) For the situation in part c, how much would you be willing to pay for market research that allows you to determine the price (\$100 or \$70) prior to your decision to invest \$185,000 in developing the product?

4. Suppose that your firm is the only producer of a high-tech sports utility vehicle for North American markets. Assume a constant marginal cost of \$25,000 to produce each vehicle and no fixed costs of production.
- a) The US demand for the vehicle is given as $Q_{US} = 18,000 - 400 P_{US}$ where price is in thousands of dollars. Supposing your firm supplies the US only, what quantity of vehicles should you produce, what price will you charge, and what profits will you make?
 - b) The Canadian demand for the vehicle is given as $Q_{CAN} = 8,000 - 100 P_{CAN}$ where price is in thousands of (US) dollars. Supposing your firm supplies Canada only, what quantity of vehicles should you produce, what price will you charge, and what profits will you make?
 - c) Suppose now that your firm is a US company, but that you can freely export vehicles to the Canadian market. Suppose also that you can make a Canadian version of the vehicle and a US version, so that the markets are completely separate (i.e., the conversion of a Canadian vehicle to a US version is very expensive, and vice versa). What quantity of vehicles should you produce and sell in Canada, what quantity of vehicles should you produce and sell in the US, and what will your profits be?
 - d) Now suppose that there is a fixed cost of production of \$ 50 million. Would your answer change to a)? To b)? To c)? Indicate why or why not in each case.