

Chapter 1

The Fundamentals of Managerial Economics



Study Outline

- I. Introduction
 - A. The Manager
 - B. Economics
 - C. Managerial Economics Defined
- II. The Economics of Effective Management
 - A. Identify Goals and Constraints
 - B. Recognize the Nature and Importance of Profits
 - 1. Economic versus Accounting Profits
 - 2. The Role of Profits
 - C. Understand Incentives
 - D. Understand Markets
 - 1. Consumer-Producer Rivalry
 - 2. Consumer-Consumer Rivalry
 - 3. Producer-Producer Rivalry
 - 4. Government and the Market
 - E. Recognize the Time Value of Money
 - 1. Present Value Analysis
 - 2. Present Value of Indefinitely-Lived Assets
 - F. Use Marginal Analysis
 - 1. Discrete Decisions
 - 2. Continuous Decisions
 - 3. Incremental Decisions
- III. Learning Managerial Economics

Key Concepts: Chapter 1

1. A manager is a person who directs resources in order to achieve a stated goal.
2. Economics is the science of making decisions in the presence of scarce resources.
3. Managerial economics is the study of how to direct scarce resources in the means that most efficiently achieve a managerial goal.
4. Opportunity cost refers to the cost of the explicit and implicit resources that are foregone when a decision is made.
5. Economic profit is the difference between the total revenue and total opportunity cost.
6. Profits signal resource holders where resources are most highly valued by society.
7. The present value (PV) of a future value (FV) received n years in the future is

$$PV = \frac{FV}{(1+i)^n}$$

where i is the guaranteed (risk-free) rate of interest.

8. When the interest rate is i , the present value of a stream of payments of FV_1, FV_2, \dots, FV_n is

$$PV = \sum_{t=1}^n \frac{FV_t}{(1+i)^t}$$

9. The net present value of a project that costs C_0 dollars today and that generates income of FV_1 one year in the future, FV_2 two years in the future, and so on for n years, is given by

$$NPV = \frac{FV_1}{(1+i)^1} + \frac{FV_2}{(1+i)^2} + \frac{FV_3}{(1+i)^3} + \dots + \frac{FV_n}{(1+i)^n} - C_0$$

Managers should accept projects that have a positive net present value, and reject ones that have negative net present values.

10. The value of an asset is the present-value of its current and future cash flows:

$$PV_{Asset} = CF_0 + \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \frac{CF_3}{(1+i)^3} + \dots$$

11. The present value of an asset that pays a perpetual cash flow of CF at the end of each period is

$$PV_{Perpetuity} = \frac{CF}{(1+i)} + \frac{CF}{(1+i)^2} + \frac{CF}{(1+i)^3} + \dots$$

$$= \frac{CF}{i}.$$

12. Maximizing profits means maximizing the value of the firm, which is the present value of current and future profits.
13. If the growth rate in profits is less than the interest rate, and both are constant, then maximizing the present value of all future profits is the same as maximizing current profits.
14. The marginal (or incremental) benefit (MB) of the managerial control variable, Q , is the change in total benefits arising from a change in the control variable:

$$MB = \frac{\Delta B}{\Delta Q}$$

15. The marginal (or incremental) cost (MC) of the managerial control variable, Q , is the change in total costs arising from a change in the control variable:

$$MC = \frac{\Delta C}{\Delta Q}$$

16. In order to maximize net benefits, the managerial control variable should be increased up to the point where marginal benefits equal marginal costs. This level of the managerial control variable corresponds to the level where marginal net benefits (MNB) are zero; nothing more can be gained by further changes in the managerial control variable.
17. When the control variable is infinitely divisible, the slope of a total value curve at a given point is the marginal value at that point. In particular, the slope of the total benefit curve at a given Q is the marginal benefit of that level of Q . The slope of the total cost curve at a given Q is the marginal cost of that level of Q . The slope of the net benefit curve at a given Q is the marginal net benefit of that level of Q .
18. Since the slope of a function is the derivative of the function, the derivative of a given function is the marginal value of that function. For example:

$$MB = \frac{dB(Q)}{dQ} \text{ and } MC = \frac{dC(Q)}{dQ}$$

19. Incremental (or yes or no) decisions are profitable whenever incremental revenues exceed incremental costs.

Questions: Chapter 1

1. List the six basic principles of effective management.
 - a.
 - b.
 - c.
 - d.
 - e.
 - f.

2. Joe faced the following options: (a) pay \$5,000 in tuition to attend classes at Econ Tech; (b) work as a fry cook for \$4,000; or (c) work as a waiter at an elite restaurant and earn \$10,000. What is Joe's opportunity cost of attending classes at Econ Tech?

3. What sources of rivalry always exist in markets serviced by two or more buyers and two or more sellers?
 - a.
 - b.
 - c.
4. What sources of rivalry always exist in markets serviced by a single seller and two or more buyers?
 - a.
 - b.
5.
 - a. State the formula for computing the present value (PV) of a future amount (FV) received in n years when the interest rate is i .
 - b. Looking at the present value formula, what happens to the present value when the interest rate increases (that is, as i increases)?
 - c. Looking at the present value formula, what happens to the present value when the future amount is received farther into the future (that is, as n increases)?
 - d. Looking at the present value formula, what happens to the present value when the amount to be received in the future increases (that is, as FV increases)?

6. Explain, in words, the condition required for a manager to maximize the net benefits derived from the use of a managerial control variable.

Technical Problems: Chapter 1

1. The manager of an office supply company is contemplating the purchase of a new copier, which will cost \$50,000 and has a useful life of 3 years. The copier will save the firm \$20,000 in year one, \$20,000 in the second year, and \$10,000 in the third year. The machine can be re-sold at the end of three years to a junk dealer for \$5,000. Alternatively, the manager can invest the \$50,000 at a guaranteed interest rate of 5%. To maximize profits, should the manager purchase the copier or invest the money at 5%?

2. Delta, Inc. is expected to grow at an annual rate of 3 percent for the foreseeable future. The current profits of Delta are \$1,000, and have not been paid as dividends. What is the value of the firm (the present value of all current and future profits) assuming the market interest rate is 6%?

3. A manager hired an economist to evaluate the benefits and costs of increasing the number of square feet (S) of inventory space. The results of the study are as follows:

$$B(S) = 4,000S - S^2$$

$$C(S) = S^2$$

Your assistant informs you that marginal benefits are $MB = 4,000 - 2S$ and marginal costs are $MC = 2S$.

- a. How many square feet should be added to maximize the net benefits?

- b. What are the maximum net benefits?

- c. How many square feet should be added to maximize total benefits?

- d. What are the maximum total benefits?

4. The manager of a software company seeks to maximize profits by producing the profit-maximizing level of output (Q). The total benefits (revenues) and costs for various levels of output are summarized below, and are given in millions of dollars. Complete the table, and answer the accompanying questions.

(1) Q	(2) B	(3) C	(4) B - C	(5) MB	(6) MC	(7) MNB
0	0	0		--	--	--
1	20	10				
2	38	25				
3	54	41				
4	58	59				
5	50	79				

- a. What level of output maximizes net benefits?

- b. What is the relation between marginal benefits and marginal cost at this level of output?

- c. What would happen if the manager attempted to maximize total benefits?

- d. Are marginal benefits zero when total benefits are maximized? Why or why not?

5. Your research department has estimated the total benefits (revenues) and costs of producing output (Q) to be

$$B(Q) = 8000Q - 3Q^2$$

and

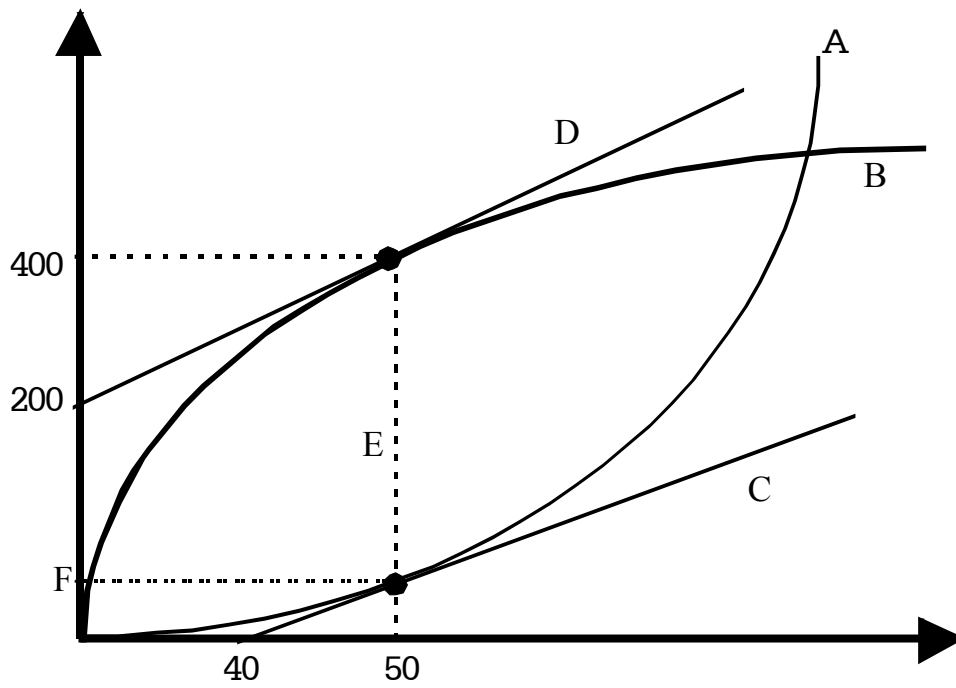
$$C(Q) = Q^2,$$

so that $MB = 8000 - 6Q$ and $MC = 2Q$.

- a. What level of Q maximizes profits?
- b. What is marginal revenue at this level of Q?
- c. What is the maximum level of profits?
6. Answer the following questions based on Exhibit 1-1.
- a. Curve A is the _____ curve.
- b. Curve B is the _____ curve.
- c. The slope of line C is the _____ of 50 units.
- d. The slope of line D is the _____ of 50 units.
- e. The length of line segment E represents the _____.
- f. The marginal benefit of using 50 units of the managerial control variable is _____.

- g. Assuming 50 units maximizes net benefits, the value of costs at point F is _____.
- h. The net benefit of using 50 units of the managerial control variable is _____.
- i. The marginal net benefit of using 50 units of the managerial control variable is _____.

Exhibit 1-1



7. You are the manager of a small print shop, and are contemplating the purchase of a new computer network designed to enhance efficiency.

a. Complete the following table.

	Current Situation	If Purchase the Network	Incremental Revenues and Costs
Total Revenue	\$100,000	\$101,000	
Variable Cost	40,000	30,000	
Direct Fixed Costs	50,000	59,000	
Indirect Fixed Costs	10,000	10,000	
Profit			

b. Should you purchase the new computer network? Explain carefully.

Multiple Choice and True/False Questions: Chapter 1

1. In general, as firms leave an industry:
 - a. accounting profits fall.
 - b. economic profits increase.
 - c. economic profits decline.
 - d. prices fall.

2. Scarce resources are ultimately allocated toward the production of goods most wanted by society because of the:
 - a. goal of firms to maximize profits.
 - b. fact that they are most efficiently utilized in these areas.
 - c. demand of consumers for inexpensive goods and services.
 - d. benevolence of managers of firms.

3. The opportunity cost of receiving ten dollars in the future as opposed to getting that ten dollars today is:
 - a. foregone interest that could be earned if you had the money today.
 - b. the value of the goods and services that money can purchase.
 - c. the relative value of that money in regard to total income.
 - d. the level of wealth for each individual and the effect an additional ten dollars will have on wealth.

4. What is the present value of receiving ten dollars one year from now, given that the interest rate is 5 percent?
 - a. \$ 9.50
 - b. \$10.05
 - c. \$ 9.52
 - d. \$ 9.77

5. If you put \$1,000 in a savings account at an interest rate of 7%, how much money will you have in one year?
 - a. \$1,007
 - b. \$1,070
 - c. \$934.58
 - d. \$930

6. If the interest rate is 7%, the present value of \$1,000 received 1 year from now would be:
 - a. \$1,007
 - b. \$1,070
 - c. \$934.58
 - d. \$930

7. A firm will have constant profits of \$10 per year at the end of each year for the next two years and zero profits thereafter. If the interest rate is six percent, what is the value of the firm?
- \$18.33
 - \$20.00
 - \$40.00
 - \$34.65
8. Suppose the interest rate is five percent, the expected growth rate of the firm is two percent, and the firm is expected to continue forever. If current-year profits are \$100, what is the value of the firm on the ex-dividend date?
- \$3,100
 - \$3,000
 - \$2,650
 - \$3,400
9. To maximize net benefits, a manager should continue to increase the managerial control variable until:
- total benefits equal total cost.
 - net benefits are zero.
 - marginal benefits equal marginal cost.
 - average cost equals average benefits.
10. Economic profits play an important role in a market economy because:
- they signal where resources are most highly valued.
 - they are used to pay workers.
 - they are used to pay taxes.
 - they provide workers an incentive to work hard.
11. The present value of \$100 received in seven years, if the interest rate is 5%, is:
- $100/(0.07)^5$.
 - $100/(1 + .07)^5$.
 - $100 (1 + .07)^5$.
 - none of the above.
12. If the marginal net benefits of Q are positive, it is profitable:
- to increase Q.
 - to decrease Q.
 - to stay at that level of Q.
 - all of the above.

13. Maximizing total benefits results in maximizing net benefits when:
 - a. costs are zero.
 - b. costs are rising.
 - c. costs are rising and then falling.
 - d. none of the above.
14. True or False: The marginal benefit curve is the slope of the total benefits curve.
15. True or False: The slope of the marginal net benefit curve is horizontal where $MB = MC$.
16. True or False: The difference in the slope of the marginal benefit curve and the marginal cost curve is maximized at the optimal level of Q .
17. True or False: The best way to learn economics is to highlight the important material in the text and then continue reading the highlighted material until you understand it.
18. True or False: The greater the interest rate, the greater the present value of a given future amount.
19. True or False: When total benefits are falling, marginal benefits are negative.
20. True or False: When total costs are rising, marginal costs are negative.

Answers to Questions: Chapter 1

1.
 - a. Identify Goals and Constraints
 - b. Recognize the Nature and Importance of Profits
 - c. Understand Incentives
 - d. Understand Markets
 - e. Recognize the Time Value of Money
 - f. Use Marginal Analysis
2. \$15,000. Joe's opportunity cost of going to college includes both the explicit cost (\$5,000) plus the implicit cost (\$10,000) of his next best alternative. In other words, by

choosing to go to college Joe gives up the opportunity to spend \$5,000 of his money on other goods or services, and he also gives up a \$10,000 job. Notice that the \$4,000 job is irrelevant since he cannot work at both jobs at the same time; the relevant implicit cost is the best of the mutually exclusive alternatives.

- 3. a. consumer-consumer rivalry
- b. consumer-producer rivalry
- c. producer-producer rivalry

- 4. a. consumer-consumer rivalry
- b. consumer-producer rivalry

- 5. a. The present value formula is:

$$PV = \frac{FV}{(1+i)^n}$$

- b. The present value falls.
 - c. The present value falls.
 - d. The present value rises.
- 6. To maximize net benefits, a manager should continue to use a control variable up to the point where the marginal benefits equal the marginal cost.

Answers to Technical Problems: Chapter 1

1. By purchasing the copier, the firm effectively earns \$20,000 in year 1, \$20,000 in year 2, and \$15,000 in year three (the \$10,000 cost savings plus the \$5,000 from the junk dealer). Thus the present value of benefits of buying the copier is

$$PV = \frac{20,000}{1.05} + \frac{20,000}{1.05^2} + \frac{15,000}{1.05^3} = \$50,145.77$$

Since this present value exceeds the cost of the copier (\$50,000), the manager maximizes profits by purchasing the copier instead of investing the \$50,000 at 5%. In other words, the net present value is positive: $NPV = PV - C_0 = \$50,145.77 - \$50,000 = \$145.77$.

2. The present value of the firm is

$$PV_{Firm} = \pi \left[\frac{1+i}{i-g} \right] = (\$1,000) \left[\frac{1+.06}{.06-.03} \right] = (\$1,000)(35.33333) = \$35,333.33$$

3. a. Equating MB and MC yields $4,000 - 2S = 2S$. Solving this equation for S reveals that net benefits are maximized by adding $S^* = 1,000$ additional square feet of inventory space.
- b. $NB(S^*) = B(S^*) - C(S^*) = 4,000(1,000) - (1,000)^2 - (1,000)^2 = 2,000,000$.
- c. To maximize total benefits, set marginal benefits equal to zero:

$$MB(S) = 4,000 - 2S = 0.$$

Solving for S yields $S^* = 2,000$.

- d. $B(S^*) = 4,000(2,000) - (2,000)^2 = 4,000,000$.

4. The completed table is as follows:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Q	B	C	B - C	MB	MC	MNB
0	0	0	0	--	--	--
1	20	10	10	20	10	10
2	38	25	13	18	15	3
3	54	41	13	16	16	0
4	58	59	-1	4	18	-14
5	50	79	-29	-8	20	-28

- a. 2 or 3 units of output.
 - b. Marginal benefits equal marginal cost at 3 units of output.
 - c. The firm would produce 4 units and make a loss of \$1 million.
 - d. No. This is because the managerial control variable is discrete, not continuous.
- 5.
- a. Equate MB and MC to get $8,000 - 6Q = 2Q$. Solving for Q yields $Q^* = 1,000$.
 - b. Marginal revenue, in this case, is simply marginal benefits. At $Q^* = 1,000$, we have $MB(Q^*) = 8000 - 6(1,000) = 2,000$.
 - c. Maximum profits, in this case, are $B(Q^*) - C(Q^*) = 8,000(1,000) - 3(1,000)^2 - (1,000)^2 = \$4,000,000$.
- 6.
- a. total cost
 - b. total benefit
 - c. marginal cost
 - d. marginal benefit

- e. net benefits of 50 units
- f. 4, since the slope of line D is $(400 - 200)/50 = 4$.
- g. 40. We know this because $MB = MC$ at 50 units of output, and from part f. $MB = 4$. Thus, the slope of line C must be 4. This implies $F/(50 - 40) = 4$. Solving for F gives us $F = 40$.
- h. $400 - 40 = 360$.
- i. 0.

7. a. The completed table looks like this:

	Current Situation	If Purchase the Network	Incremental Revenues and Costs
Total Revenue	\$100,000	\$101,000	\$1,000
Variable Cost	40,000	30,000	(10,000)
Direct Fixed Costs	50,000	59,000	9,000
Indirect Fixed Costs	10,000	10,000	0
Profit	0	\$2,000	\$2,000

- b. You should purchase the new computer network because the incremental revenues of \$1,000 exceed the incremental costs of \$-1,000. In other words, you will reduce your costs by \$1,000 by purchasing the new network, and you also generate an additional \$1,000 in revenues, for a total increase in profit of \$2,000.

Answers to Multiple Choice and True/False Questions: Chapter 1

1. b
2. a
3. a
4. c
5. b
6. c
7. a
8. d
9. c
10. a
11. d
12. a
13. a
14. True
15. False; $MNB = 0$ and the slope is negative.
16. False; net benefits are maximized.
17. False; work problems!
18. False; the lower the PV.
19. True
20. False; they are positive.