Raw materials
Direct labor
Depreciation
Supplies
Utilities
Property taxes
Administrative salaries
Payroll taxes
Insurance (building and equipment)
Clerical salaries
Sales commissions
Rent
Interest on borrowed money

2-4. In your own words, describe the life-cycle cost concept. Why is the potential for achieving life-cycle cost savings greatest in the acquisition phase of the life cycle? (2.2)

2-5. Explain why perfect competition is an ideal that is difficult to attain in the United States. List several business situations in which perfect competition is approached. (2.3)

2-6. Suppose we know that $p = 1{,}000 - D/5$, where p = price in dollars and D = annual demand. The *total* cost per year can be approximated by $\$1{,}000 + 2D^2$. (2.3)

a. Determine the value of D that maximizes profit.

b. Show in part (a) that profit has been maximized rather than minimized.

2-7. A company produces circuit boards used to update outdated computer equipment. The fixed cost is $42,000 per month and the variable cost is $53 per circuit board. The selling price per unit is $p = \$150 - 0.02D$. Maximum output of the plant is 4,000 units per month. (2.3)

a. Determine optimum demand for this product.

b. What is the maximum profit per month?

c. At what volumes does breakeven occur?

d. What is the company's range of profitable demand?

2-8. A company has established that the relationship between the sales price for one of its products and the quantity sold per month is approximately $D = 780 - 10p$ units (D is the demand or quantity sold per month, and p is the price in dollars). The fixed cost is $800 per month, and the variable cost is $30 per unit produced. What number of units, D^*, should be produced per month and sold to maximize net profit? What is the maximum profit per month related to the product? Also, determine D_1' and D_2'. (2.3)

2-9. A company estimates that the relationship between unit price and demand per month for a potential new product is approximated by $p = \$100.00 - \$0.10D$. The company can produce the product by increasing fixed costs $17,500 per month, and the estimated variable cost is $40.00 per unit. What is the optimal demand, D^*, and based on this demand, should the company produce the new product? Why? (2.3)

a. Work out the complete solution by differential calculus, starting with the formula for profit or loss per month.

b. Solve graphically for an approximate answer.

2-10. A large wood products company is negotiating a contract to sell plywood overseas. The fixed cost that can be allocated to the production of plywood is one million dollars per month. The variable cost per thousand board feet is $131.50. The price charged will be determined by $p = \$700 - (0.05)D$ per 1,000 board feet. (2.3)

a. For this situation determine the optimal monthly sales volume for this product and calculate the profit (or loss) at the optimal volume.

b. What is domain of profitable demand during a month?

2-11. A company produces and sells a consumer product, and thus far has been able to control the volume of the product by varying the selling price. The company is seeking to maximize its net profit. It has been concluded that the relationship between price and demand, per month, is approximately $D = 500 - 5p$, where p is the price per unit in dollars. The fixed cost is $1,000 per month, and the variable cost is $20 per unit. Obtain the answer, both mathematically and graphically, to the following questions: (2.3)

a. What is the optimal number of units that should be produced and sold per month?

b. What is the maximum profit per month?

c. What are the breakeven sales quantities (range of profitable demand volume)?

2-12. A company estimates that as it increases its sales volume by decreasing the selling price of its product, revenue $= aD - bD^2$ (where D represents the units of demand per month, with a and b constants). The fixed cost is $1,000 per

(Pr. 2-13)

	Site A	Site B
Average hauling distance	4 miles	3 miles
Annual rental fee for solid waste site	$5,000	$100,000
Hauling cost	$1.50/yd^3-mile	$1.50/yd^3-mile

month, and the variable cost is $4 per unit. If a = $6 and b = $0.001, determine the sales volume for maximum profit, and the maximum profit per month. (2.3)

2-13. A municipal solid waste site for a city must be located at Site A or Site B. After sorting, some of the solid refuse will be transported to an electric power plant where it will be used as fuel. Data for the hauling of refuse from each site to the power plant is shown in the table above.

a. If the power plant will pay $8.00 per cubic yard of sorted solid waste delivered to the plant, where should the solid waste site be located? Use the city's viewpoint and assume that 200,000 cubic yards of refuse will be hauled to the plant for one year only. One site must be selected. (2.2)

b. Referring to the electric power plant above, the cost Y in dollars per hour to produce electricity is $Y = 12 - 0.2X + 0.27X^2$, where X is in megawatts. Revenue in dollars per hour from the sale of electricity is $16X - 0.2X^2$. Find the value of X that gives maximum profit. (2.3)

2-14. A plant has a capacity of 4,100 hydraulic pumps per month. The fixed cost is $504,000 per month. The variable cost is $166 per pump, and the sales price is $328 per pump (assume that sales equal output volume). What is the breakeven point in number of pumps per month? What percentage reduction will occur in the breakeven point if fixed costs are reduced by 18% and unit variable costs by 6%? (2.3)

2-15. Suppose that the ABC Corporation has a production (and sales) capacity of $1,000,000 per month. Its fixed costs—over a considerable range of volume—are $350,000 per month, and the variable costs are $0.50 per dollar of sales. (2.3)

a. What is the annual breakeven point volume (D')? Develop (graph) the breakeven chart.

b. What would be the effect on D' of decreasing the variable cost per unit by 25% if the fixed costs thereby increased by 10%?

c. What would be the effect on D' if the fixed costs were decreased by 10% and the variable cost per unit increased by the same percentage?

2-16. A company produces and sells a consumer product and is able to control the demand for the product by varying the selling price. The approximate relationship between price and demand is

$$p = 38 + \frac{2,700}{D} - \frac{5,000}{D^2} \quad \text{for } D \geq 1$$

where p is the price per unit in dollars and D is the demand per month. The company is seeking to maximize its profit. The fixed cost is $1,000 per month and the variable cost (c_v) is $40 per unit. (2.3)

a. What is the number of units that should be produced and sold each month to maximize profit?

b. Show that your answer to part (a) maximizes profit.

2-17. The fixed cost related to the production of a product is $500,000 per year. Assume that the variable cost is $20,000 and the selling price is $30,000 for each percentage point of annual output capacity (which equals sales demand). Thus, the maximum sales per year are $3,000,000 (at 100% of output capacity), and we have: (2.3)

C_f = $500,000 per year (Fixed cost)
c_v = $20,000/1% of annual output capacity (Variable cost/unit)
p = $30,000/1% of annual output capacity (Selling price/unit)

a. Determine the breakeven point for this situation.

b. Develop the mathematical expression for profit or loss in this situation as a function of demand, D.

2-18. A plant operation has fixed costs of $2,000,000 per year, and its output capacity is 100,000 electrical appliances per year. The variable cost is $40 per unit, and the product sells for $90 per unit.