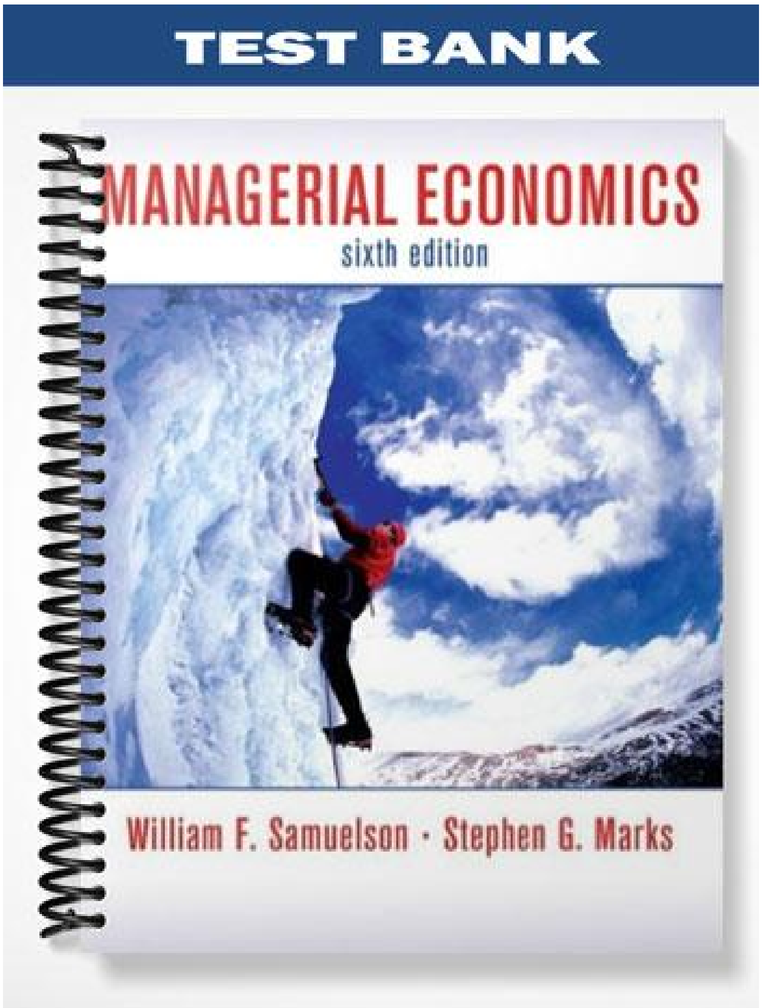
TEST BANK
MANAGERIAL ECONOMICS
sixth edition
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File: Ch02; CHAPTER 2: **Optimal Decisions Using Marginal Analysis**

Each question contains a code showing the section of the chapter text from which it was taken. The codes for this chapter are:

Code	Section
1	A Simple Model of the Firm
2	Marginal Analysis
3	Marginal Revenue and Marginal Cost
4	Sensitivity Analysis
5	Appendix

MULTIPLE CHOICE

1. In the simple model of the firm, management's main tasks are to
a) Set the quantity of output and estimate costs.
b) Set output quantity and price.
c) Set price and estimate revenue.
d) Determine the scale of operation and estimate profit.
e) Set advertising spending and price.

ANSWER: b
SECTION: 1

2. According to the model of the firm, management's main goal is to
a) Satisfy its shareholders.
b) Maximize profit.
c) Maximize its market share.
d) Achieve efficiency – that is, minimize its average cost per unit.
e) Maintain steady and predictable earnings growth.

ANSWER: b
SECTION: 1

3. According to the law of demand, if a firm reduces the price of its good
a) Consumers in aggregate will demand more units.
b) Consumers will demand roughly the same number of units.
c) Consumers will demand more units only if they have the income to pay for them.
d) The effect is uncertain; it depends on the behavior of rival firms.
e) Competing firms are sure to match the price cut.

ANSWER: a
SECTION: 1

4. According to the simple model of the firm, management can predict

a) The market price only within a wide margin of error.
b) The behavior of its main competitors with certainty.
c) Costs with certainty, but revenues imprecisely.
d) Nether revenues nor costs very precisely.
e) Both revenues and costs with certainty.

ANSWER: e
SECTION: 1

5. Demand is given by Q = 600 - 30P. At price P = $15, the firm's unit sales are
a) 100.
b) 150.
c) 300.
d) 450.
e) 600.

ANSWER: b
SECTION: 1

6. Demand is given by: P = 1,750 - 25Q. If the firm wishes to sell 50 units, the requisite price is
a) $500.
b) $400.
c) $300.
d) $200.
e) $100.

ANSWER: a
SECTION: 1

7. The firm's demand curve is given by Q = 800 - 2P. Therefore, its inverse demand curve is
a) MR = 800 – 4P.
b) P = 800 – 2Q.
c) P = 400 - .5Q.
d) P = 800 - .5Q..
e) There is insufficient information to determine the inverse demand curve.

ANSWER: c
SECTION: 1

8. A firm's total cost function is given by: $C = 100 + 10Q + 2Q^2$. At Q = 10,
a) Total cost is 400 and marginal cost is 10.
b) Marginal cost is constant.
c) Average cost is 50.
d) Fixed cost is 100 and marginal cost is 50.
e) None of the above answers is correct.

ANSWER: d
SECTION: 3

9. Marginal analysis measures the effect of
a) Changing the firm's objectives.
b) Changes in demand on profit.
c) Small changes in one or more decision variables.
d) Small changes in revenues and costs.
e) Small changes in external economic factors.

ANSWER: c
SECTION: 2

10. At its current output level, a firm's marginal profit is positive. Therefore, it should
a) Decrease output until marginal profit is zero.
b) Increase output because MR < MC.
c) Increase both its output and its price.
d) Increase output because MR > MC.
e) Increase output until it is producing at full capacity.

ANSWER: d
SECTION: 2

11. A firm's profit equation is given by: $\pi = -200 + 80Q - .2Q^2$. Therefore,
a) Marginal profit = 80 - .2Q.
b) The firm's profit-maximizing output is Q = 400.
c) The firm's profit-maximizing output is Q = 200.
d) Answers a and b are both correct.
e) None of the answers above is correct.

ANSWER: c
SECTION: 2

12. Marginal revenue is the
a) Price the firm obtains for the last unit sold.
b) Change in revenue from a unit increase in price.
c) Change in revenue from producing and selling an additional unit of output.
d) Amount of additional revenue from an increase in demand.
e) Answers a and c are both correct.

ANSWER: c
SECTION: 3

13. Marginal cost is the
a) Additional cost of increased overhead.
b) Additional cost of producing an extra unit of output.
c) Additional cost of increasing the scale of production.
d) Additional cost of increasing use of an input such as labor.
e) Variable cost of production.

ANSWER: b
SECTION: 3

14. Starting from the firm's cost function, marginal cost can be determined by
a) Dividing total cost by total output.
b) Computing the derivative of the cost function.
c) Dividing total variable cost by total output.
d) Computing the difference in cost between two vastly different scales of operation.
e) Answers b and c are both correct.

ANSWER: b
SECTION: 3

15. For a downward sloping demand curve, the associated marginal revenue curve
a) Coincides with the demand curve.
b) Lies below and parallel to the demand curve.
c) Has the same price intercept but a steeper slope than the demand curve.
d) Is positive for all levels of sales.
e) None of the above answers is correct.

ANSWER: c
SECTION: 3

16. To maximize profit, management should
a) Set output to minimize its average cost per unit.
b) Set output so that average revenue just equals average cost.
c) Set price to maximize profit margin per unit.
d) Set output so that marginal revenue equals marginal cost.
e) Set output so that marginal revenue is zero.

ANSWER: d
SECTION: 3

17. A decrease in fixed costs implies that
a) Marginal revenue will increase; marginal cost will decrease.
b) Marginal revenue will not change; marginal cost will decrease.
c) Neither average total cost nor marginal cost will change.
d) Neither marginal revenue nor marginal cost will change.
e) Both marginal revenue and marginal cost will decrease.

ANSWER: d
SECTION: 4

18. Suppose that the cost of a raw material decreases. The most likely effect is that
a) Price will be unchanged, and quantity will increase.
b) Price will decrease, and quantity will increase.
c) Both price and quantity will decrease.

d) Price will decrease, and quantity will be unchanged.
e) Both price and quantity will be unchanged.

ANSWER: b
SECTION: 4

19. A firm negotiates a new labor contract, raising the average hourly wage. What is the most likely effect on the firm's price and output?
a) No effect. Both price and quantity will be unchanged.
b) Price will increase, and quantity will be unchanged.
c) Both price and quantity will increase.
d) Price will be unchanged, and quantity will decrease.
e) Price will increase, and quantity will decrease.

ANSWER: e
SECTION: 4

20. The demand for a firm's product dramatically increases. What are the most likely effects on the marginal revenue and marginal cost curves?
a) Marginal revenue will increase, and marginal cost will decrease.
b) No effect. Neither will change.
c) Both marginal revenue and marginal cost will increase.
d) Marginal revenue will be unchanged; marginal cost will increase.
e) Marginal revenue will increase; marginal cost will not change.

ANSWER: e
SECTION: 4

21. In franchising, conflicts between parent and storeowners arise because
a) The parent seeks higher sales than store owners want.
b) The parent cannot trust the store owners.
c) The two sides have to negotiate how advertising costs are split.
d) The parent seeks higher prices; store owners prefer lower prices.
e) The parent make nearby store owners compete against one another.

ANSWER: a
SECTION: 4

22. If a firm's profit is given by: $\pi = -2Q^3 + 36Q^2 - 120Q - 150$, then its optimal output is
a) Q = 12
b) Q = 10
c) Q = 2
d) A maximum does not exist. Profit is unbounded.
e) None of these answers is correct.

ANSWER: b
SECTION: 4

SHORT ANSWER

23. What is the "law of demand"? How do managers use it in decision-making?

ANSWER: The law of demand states that all other factors held constant, the higher the unit price of a good, the fewer the number of units demanded by consumers and, consequently, sold by the firm. Managers use the demand curve as the basis for predicting the revenue consequences of alternative output and pricing policies.
SECTION: 1

24. Carefully define marginal analysis, and explain how it is useful in managerial economics.

ANSWER: Marginal analysis is the process of considering small changes in a decision and determining whether such a change will improve the ultimate objective. The manager can follow a clear rule: Make a small move to a nearby alternative if and only if the move will improve one's objective. Keep moving until no further move will help.
SECTION: 2

25. Suppose that the inverse demand curve is given by $P = 2{,}500 - 10Q$. Compute total revenue and marginal revenue, and determine the quantity that maximizes total revenue.

ANSWER: $R = P \bullet Q = 2{,}500Q - 10Q^2$. In turn, $MR = dR/dQ = 2{,}500 - 20Q$. We maximize revenue by setting MR equal to 0. Therefore, $2{,}500 - 20Q = 0$ implies $Q = 125$.
SECTION: 3

26. Suppose that a firm sells in a highly competitive market, in which the going price is $15 per unit. The firm's cost equation is $C = \$25 + .25Q^2$.
a) Find the profit-maximizing level of output for the firm. Determine its level of profit.
b) Suppose that fixed costs increase to $75. Verify that this change in fixed costs does not affect the firm's optimal output.

ANSWER: a) In a competitive market, $R = P \bullet Q = 15Q$ implying $MR = dR/dQ = 15$. In turn, $MC = dC/dQ = .5Q$. Setting MR = MC, we find that $15 = .5Q$, or $Q = 30$. At $Q = 30$, we find that R = $450, C = 250, and $\pi = \$200$.
b) The increase in fixed cost has no effect on MR or MC. Accordingly, the firm's optimal level of output is unaffected. With the $50 rise in fixed cost, the firm's profit falls to $150.
SECTION: 4

27. Demand for a firm's product is: $P = 36 - .2Q$, The firm's cost equation is: $C = 200 + 20Q$.
a) Determine the firm's optimal quantity and price.
b) Suppose that costs change to $C = 100 + 24Q$,. Determine the new optimal quantity and price. Explain why the results differ from those in part a.

ANSWER: a) We can derive $MR = 36 - .4Q$ and $MC = 20$. Setting MR = MC implies $Q^* = 40$. From the price equation, it follows that $P^* = 36 - (.2)(40) = 28$. Finally, profit is: $\pi = \$1{,}120 - 1{,}000 = \$120$.

b) With the new cost function, MC = 24. Setting MR = MC implies 36 - .4Q = 24, or Q* = 30. In turn, P* = 36 – (.2)(30) = 30. Finally, profit is: π = \$900 – 820 = \$80. Here, the reduction in fixed cost has no impact on output, but the increase in marginal cost induces a smaller output quantity and a greater price.
SECTION: 4

28. A firm faces the demand curve, P = 80 - 3Q, and has the cost equation C = 200 + 20Q.
a) Find the optimal quantity and price for the firm.
b) Now suppose that demand changes to P = 110 - 3Q. Find the new optimal quantity and price. Has there been an increase or a decrease in demand? Explain.

ANSWER: a) Maximize profit by setting MR = MC. From the price equation, we know that MR = 80 - 6Q. Equating this to a MC of 20 implies 80 - 6Q = 20, or Q* = 10. In turn, P* = 80 - (3)(10) = 50.
b) From the new price equation, P = 110 - 3Q, we find MR = 110 - 6Q. Setting MR = MC implies 110 - 6Q = 20, or Q* = 15. In turn, P* = 110 - (3)(15) = 65. The increase in demand (in this case a parallel outward shift in the demand curve) has induced the firm to increase both its price and quantity.
SECTION: 4

29. Suppose that a firm sells in a competitive market at a fixed price of \$12 per unit. The firm's cost function is: C = 200 + 4Q. In this case, how can the firm use MR and MC to maximize its profit?

ANSWER: Here, R = 12Q so that MR = 12. In turn, MC = 4. Clearly, it is not possible to apply the rule MR = MC. However, we know that $M\pi$ = 12 – 8 = 4 > 0. So the firm gains additional profit by continuing to increase output. It should do so until it reaches the capacity limit of its production facility.
SECTION: 3

30. In each case below, find the profit-maximizing level of output. Verify that each is a maximum by checking the second derivative.
a) $\pi = -50 + 200Q - 20Q^2$.
b) $\pi = -100 + 300Q - 4Q^3$.

ANSWER: a) $M\pi = 200 - 20Q$. Setting $M\pi = 0$ implies: Q* = 10.
b) $M\pi = 300 - 12Q^2$. Setting $M\pi = 0$ implies: Q* = 5. The second derivative is negative, so Q* = 5 is the profit-maximizing level of output.
SECTION: 5

31. Carefully explain the economic importance of the Lagrange multiplier. How might a manager use it in decision making?

ANSWER: The Lagrange multiplier measures the marginal change in the objective function at the constrained optimum. Thus, it measures the cost to the firm (in terms of lost profit) of the binding constraint. Managers can use the value of the Lagrange multiplier to determine whether it is worthwhile to relax or shift the constraint. For example, suppose that the cost of relaxing a constraint (for instance, increasing the firm’s limited production capacity) is larger than the increase in profits that would result from the change. In this case, it does not pay to expand capacity. Management should accept the constrained level of profit as the optimal outcome.
SECTION: 5

ESSAY

32. According to the law of demand, an increase in price will lead to a drop in the quantity of units sold by a firm. What are the reasons for the decrease in quantity?

ANSWER: There are three sources of the decrease: (1) decreased sales to the firm's current customers, as they choose to buy less at the higher price; (2) sales lost to competing suppliers; and (3) decrease in new customers, who choose to buy from competing suppliers. In particular circumstances, these will be important to a greater or lesser degree.
SECTION: 1

33. Max Whitley, manager of Whitley Construction, builds new homes in a booming community in the Midwest. Although sales have slowed because of a national recession, it now looks as if the recession is about to end. Max wants to be ready with material, labor, and foremen to meet the demand for housing. Last year, Max built and sold 40 “starter homes,” the most popular model. Max thinks that his sales will increase to 50 units over the current year. The going market price for this model (which Max and his numerous competitors have charged) has been $175,000. In addition, Whitley Construction's marginal cost of building this model averages $155,000.
a) Based on these facts, recommend a course of action for Max.
b) Suppose that the economic boom raises the cost of labor and raw materials, so that the additional cost of a starter house rises to $165,000. What is Max's most profitable course of action? Explain.

ANSWER: a) Since Max can expect to make $20,000 marginal profit on each home, he should attempt to build and sell a maximum number of units. He should monitor market demand (are home sales really robust enough to justify building 50 units?). If the price is truly market determined (note the “many competitors”), Max may not be able to increase his sale price very much. However, he should take advantage of every opportunity to sell more homes, since marginal revenue is above marginal cost.
b) If the market price is competitively determined, Max will have little opportunity to pass on such a cost increase in the form of a higher price. (Whitley's new home sales would dwindle quickly if it charged a price above the competitive level). The most profitable course of action is to sell new homes at the lower profit margin of $10,000 per house. An alternative choice is to reduce construction of starter homes and increase production of larger, more expensive homes, assuming that the profit margins are greater on these.
SECTION: 2

34. War Game, Inc. produces games that simulate historical battles. The market is small but loyal, and War Game is the largest manufacturer. It is thinking about introducing a new game in honor of the sixtieth anniversary of the end of World War II.
Based on historical data regarding sales, War Game management forecasts demand for this game to be $P = 50 - .002Q$, where Q denotes unit sales per year, and P denotes price in dollars. The cost of manufacture (based on royalty payments to the designer of the game, and the costs of printing and distributing) is $C = 140{,}000 + 10Q$.
a) If the goal of War Game is to maximize profit, calculate the optimal output and price.
b) If instead the company's goal is to maximize sales revenue, what is its optimal price and quantity?

ANSWER: a) The company's profit equation is: $\pi = 50Q - .002Q, - 10Q - 140{,}000$. To maximize profit set $M\pi = 0$. Therefore, $40 - .004Q = 0$, implying $Q = 10{,}000$. In turn, $P = 50 - (.002)(10{,}000) = \$30$ per game.
b) The company's revenue equation is $R = P \bullet Q = 50Q - .002Q,$. To maximize revenue set $MR = 0$: Therefore, $50 - .004Q = 0$, implying $Q = 12{,}500$. In turn, $P = 50 - (.002)(12{,}500) = \$25$ per game.
SECTION: 4

35. Night Timers is a small company manufacturing glow-in-the-dark products. One of the hottest items the engineering department has developed is adhesive tape that can be applied to walls and floors. Night Timers' chief engineer anticipates that the product will be sold in ten-foot rolls. At present, the company's maximum production capacity is 140,000 rolls per year. The engineer believes the cost function to be described by: C = \$50,000 + .25Q. (The high fixed costs represent development cost and tooling to prepare coating equipment). Night Timers' president seeks to establish a price that maximizes profit (since she is the chief stockholder). She thinks that the firm should be able to sell at least 125,000 rolls of tape per year.
a) If Night Timers plans to sell 125,000 rolls per year, what is the necessary price if the firm is to break even? What if it can only sell 100,000?
b) The marketing manager forecasts demand for the tape to be: Q = 350,000 - 200,000P.
Find the firm's profit-maximizing output and price.
c) If the demand forecast in part b is realized in the first year of production, should the company consider expanding capacity? Explain.

ANSWER: a) Break even implies R = C or P•Q = 50,000 + .25Q at the level of output indicated. To find the break-even price, set Q = 125,000 and solve for P. Doing so, we find: P = \$.65 per unit. If Q = 100,000, the break-even price rises to: P = \$.75 per unit.
b) After rearranging the demand equation, we have P = 1.75 - Q/200,000. Thus, MR = 1.75 - Q/100,000. From the cost function, we know that MC = .25. Set MR = MC to maximize profit: 1.75 - Q/100,000 = .25. Therefore, Q = (1.5)(100,000) = 150,000 rolls. However, maximum capacity is 140,000 rolls. Thus, an output of 140,000 is the best the company can expect to do. The requisite price is: P = 1.75 - 140,000/200,000 = \$1.05. The firm's projected profit is: (1.05 - .25)(140,000) - 50,000 = \$62,000.
c) The relevant question is whether the increased profit of expanding capacity exceeds the increased cost of doing so. If it could produce and sell 150,000 rolls (by lowering price to \$1), the company's profit would increase very slightly to: (1 - .25)(150,000) - 50,000 = \$62,500. The extra \$500 in profit is clearly not worth the cost of expansion.
SECTION: 4

36. KopyKat specializes in printing business cards and résumé's, using the latest laser technology. After analysis of the business, the manager has determined that weekly demand can be approximated by P = 25 – .001Q. The firm's cost function is C = 25,000 + 13Q + .002Q^2, where Q is output per week.
a) Determine the firm's profit maximizing price and output.
b) The night supervisor believes that extending KopyKat's hours by two hours in the evening would substantially increase volume. The manager is willing to stay open for two hours over the next three months as an experiment. What results would lead you to recommend that the store remain open later in the evening on a permanent basis?
c) A former employee decides to sue KopyKat, alleging employment discrimination. Although management claims innocence, they agree to settle out of court. The settlement requires KopyKat to pay the employee \$10,000 per month for the next year. Determine the optimal price and output for the shop under these new conditions.

ANSWER: a) The inverse demand function P = 25 - .001Q implies MR = 25 - .002Q. Also MC = dC/dQ = 13 + .004Q. Setting MR = MC, we have: 25 - .002Q = 13 + .004Q, or .006Q = 12. Thus, Q = 2,000 units per week. The optimal price is P = 25 - (.001)(2,000) = \$23 per unit.
b) Keeping KopyKat open additional hours means incurring some additional labor costs (If volume increases, production cost will increase as well). As always, the decision for the manager hinges on whether the increased volume from longer hours generates enough additional revenue to cover the increased cost of longer hours. An experiment for three months should presumably provide enough data to let the manager decide if the move is "worth it."
c) The \$10,000 a month payment represents an increase in the firm's fixed costs and has no impact on marginal revenue or marginal cost. Thus, the firm should not alter its pricing or production decisions.
SECTION: 4

37. The current manager of a small bicycle shop estimates the demand curve for a child's starter bike to be: P = 80 - 2Q. Costs are given by C = 200 + 20Q. The former owner of the shop (now retired) urges the manager to keep prices low so as to increase sales and maximize revenue. (The shop pays the former owner 5% of each dollar of earned revenue.) If current management follows the former owner's goal, what sales output and price should it set? What strategy would you recommend for management?

ANSWER: If the manager obeys the wishes of the former owner and maximizes revenue, she would set output at the point where MR is equal to 0. From the demand curve, we have: R = P•Q = (80 - 2Q)Q = 80Q - 2Q, so that MR = dR/dQ = 80 - 4Q. Setting MR = 0 implies Q = 20 bikes. In turn, P = $40 per bike and π = R - C = 800 - 600 = $200.
But, the proper goal is to maximize profit. Thus, the manager should follow the optimal rule: MR = MC. We know that MC = 20. Therefore, 80 - 4Q = 20, or Q = 15 bikes. In turn, P = $50 per bike, and π = R - C = 750 - 500 = $250. With an optimal output and pricing policy, the shop can increase its profit by 25% compared to the revenue-maximizing outcome.
SECTION: 4

38. a) A manufacturer produces and sells small farm tractors. Its annual fixed costs are $15 million, and its marginal cost per tractor is $20,000 per unit. Demand for small tractors is given by: P = 30,000 - Q, where P denotes price in dollars and Q is annual sales. Find the firm's profit-maximizing output, price, and annual profit.
b) Next year, agriculture prices fall and the farming sector faces a mild recession. Demand drops to: P = 26,000 – Q. Suppose the recession is only **temporary**, and demand will recover soon. What price and output adjustment should the firm make during the recession? Instead, what should the firm do if the demand drop is **permanent**?

ANSWER: a) To maximize profit set MR = MC. Therefore, we have MR = 30,000 - 2Q = 20,000, implying Q* = 5,000 tractors, and P = 30,000 – 5000 = $25,000 per tractor. The firm's total profit is: (25,000 – 20,000)(5,000) – 15,000,000 = $10,000,000.
b) With the fall in demand, we find the firm's new optimal output: MR = 26,000 - 2Q = 20,000, implying Q* = 3,000 and P* = 26,000 –3,000 = $23,000. Contribution now becomes (3,000)(3,000) = $9,000,000 and the firm's total profit is –$6,000,000. During a temporary downturn, the firm should lower its price and output because it is making a positive contribution toward its fixed cost. This way it is minimizing its short-term loss. If the fall in demand is permanent, the firm should eventually shut down to avoid continuing losses.
SECTION: 4

39. Turbo produces two lines of flash-memory drives. Its deluxe model has the inverse demand equation: $P_D = 70 - .05Q_D$ where Q_D is the number of units sold per week. For its economy model, the price equation is: $P_E = 30 - .05Q_E$. Turbo's marginal cost is $10 per unit for either drive, and it produces both on a single assembly line that has a maximum capacity of 875 drives per week.
a) Determine the profit-maximizing outputs and prices of the drives.
b) Answer the questions in part a, supposing that demand for the economy drive increases to: $P_E = 50 - .04Q_E$.

ANSWER: a) Setting $M\pi_D = 0$ implies $60 - .1Q_D = 0$ or $Q_D = 600$ drives. For the economy version, we have $M\pi_E = 20 - .1Q_D = 0$, so $Q_E = 200$ drives. The corresponding prices are: P_D = $40 and P_E = $20. The total output is within the firm's capacity.
b) Given the increase in economy demand, Turbo's new optimal output becomes $Q_E = 500$ drives, so total output would exceed total capacity. The constrained optimization problem (using the Lagrangian

approach) must satisfy the optimality condition: $M\pi_D = M\pi_E$, or $60 - .1Q_D = 40 - .08Q_E$, as well as the capacity constraint, $Q_D + Q_E = 875$. Solving these two equations in two unknowns implies $Q_D = 500$ drives and $Q_E = 375$ drives. The new prices are: $P_D = \$45$ and $P_E = \$35$.
SECTION: 5