Group 1 problems:

In Problems 19–36 determine whether $\lim_{x \to c} f(x)$ exists by graphing the function. If it exists, find $\lim_{x \to c} f(x)$.

586/ **29.** $f(x) = \begin{cases} 2x + 5 & \text{if } x \neq 2 \\ 9 & \text{if } x = 2 \end{cases} \quad c = 2$

596/ **23.** $\lim_{x \to 2} \dfrac{x^2 - 4}{x - 2}$

611/ *In Problems 1–14 determine whether the function f is continuous at c.*

7. $f(x) = \begin{cases} 3x - 1 & \text{if } x < 1 \\ 4 & \text{if } x = 1 \\ 2x & \text{if } x > 1 \end{cases} \quad c = 1$

622/ *In Problems 21–30 find the derivative of f. Use formula (4).* (limit definition of derivative)

21. $f(x) = 2x - 4$

640/ *In Problems 73–82 find the value of the derivative at the indicated point.*

73. $y = x^4$, at (1, 1)

686/ *In Problems 1–52 find the derivative of each function.*

13. $f(x) = \sqrt{e^x}$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

11. $4x^3 + 2y^3 = x^2$

740/ *In Problems 27–46 follow the seven steps on page 731 to graph f.*

27. $f(x) = x^3 - 6x^2 + 1$

740/ *In Problems 47–54 determine where $f'(x) = 0$. Use the Second Derivative Test to determine the local maxima and local minima of each function.*

47. $f(x) = x^3 - 3x + 2$

740/ **61. Cost and Revenue Functions** For a certain production facility the cost function is

$$C(x) = 2x + 5$$

and the revenue function is

$$R(x) = 8x - x^2$$

where x is the number of units produced (in thousands) and R and C are measured in millions of dollars.

(a) Find the profit function $P(x) = R(x) - C(x)$.
(b) Where is the profit a maximum?
(c) What is the maximum profit?
(d) Where is the revenue a maximum?
(e) What is the maximum revenue?

800/ **13.** $\int (x^2 + 2e^x)\, dx$

806/ *In Problems 1–34 evaluate each indefinite integral. Use the substitution method.*

13. $\int \frac{x}{\sqrt[5]{1 - x^2}}\, dx$

813/ *In Problems 9–18 find the particular solution of each differential equation, using the indicated boundary condition.*

11. $\frac{dy}{dx} = x^2 - x$

$y = 3$ when $x = 3$

813/ *In Problems 9–18 find the particular solution of each differential equation, using the indicated boundary condition.*

13. $\frac{dy}{dx} = x^3 - x + 2$

$y = 1$ when $x = -2$

823/ **7.** $\int_0^1 (t^2 - t^{3/2})\, dt$

823/ **23.** $\int_0^1 e^{-x}\, dx$

823/ **24.** $\int_0^1 x^2 e^{x^3}\, dx$

836/ *In Problems 11–28 find the area enclosed by the graphs of the given functions and lines. Draw a sketch first.*

17. $f(x) = \sqrt{x}, \quad g(x) = x^3$

861/ *In Problems 1–10 find the average value of each function f over the given interval.*

1. $f(x) = x^2$, over $[0, 1]$

869/ **13. Consumer Arrival** At a supermarket, customers arrive at a checkout counter at the rate of 60 per hour. What is the probability that 8 or fewer will arrive in a period of 10 minutes?

878/ *In Problems 17–24 compute the expected value for each probability density function.*

19. $f(x) = 2x$, over $[0, 1]$

878/ **25.** A number x is selected at random from the interval [0, 5]. The probability density function for x is

$$f(x) = \tfrac{1}{5} \qquad \text{for } 0 \le x \le 5$$

Find the probability that a number is selected in the subinterval [1, 3].

898/ *In Problems 1–6 find f_x, f_y, $f_x(2, -1)$, and $f_y(-2, 3)$.*

3. $f(x, y) = (x - y)^2$

905/ *In Problems 7–24 find all critical points and determine whether they are a local maximum, a local minimum, or a saddle point.*

7. $f(x, y) = 3x^2 - 2xy + y^2$

912/ *In Problems 1–12 use the method of Lagrange multipliers.*

1. Find the maximum value of $z = f(x, y) = 3x + 4y$ subject to the constraint $g(x, y) = x^2 + y^2 - 9 = 0$.

Extra review 1. Evaluate: $\int_1^2 \frac{\ln^3 x}{x}\, dx$

Extra review 2. Find $\lim_{h \to 0} \frac{(x+h)^2 - x^2}{h}$ when $x = -2$

Extra review 3. Find $\lim_{h \to 0} \frac{\cos(x+h) - \cos x}{h}$ when $x = \frac{\pi}{2}$

Extra review 4. If $3x^2 + 4y^2 = 2x$, then use implicit differentiation to find $\frac{dy}{dx}$.

Extra review 5. If $x^4 + 3xy^3 - 16 = y^3$, then use implicit differentiation to find $\frac{dy}{dx}$.

Extra review 6. Solve the differential equation $\frac{dy}{dx} = 4x^3 - 6x^2 + x - 4$ when $y = 3$ and $x = 1$

Extra review 7. Evaluate: $\int \frac{1}{6x}\,dx$

Extra review 8. A small company manufactures and sells bicycles. The production manager has determined that the cost function is $C(x)=75+10x$ and the revenue function is $R(x)=70x-2x^2$. Find the maximum profit.

Extra review 9. A firm determines that its total profit in dollars from the production and sale of x units of a product is given by $P(x)=\dfrac{1500}{x^2-6x+10}$. Find the number of units x for which the total profit is a maximum.

Extra review 10. Find $\dfrac{d^2y}{dx^2}$ if $y=\dfrac{x+1}{x-1}$

Extra review 11. Find the area bounded by
$y=-\ln x+2,\quad x=1,\ \text{and}\quad x=2$.

Extra review 12. Find $\dfrac{d}{dx}\left(3x-2x^2\right)^3$

Extra review 13. If $y=\cos\left(x^2\right)$, then $y'=$

Extra review 14. Evaluate: $\int_1^4 \frac{1}{4y}\,dy$

Extra review 15. Sketch the graph of some function such that:

$f'(x) > 0$ when $x < -2$ or $x > 2$

$f'(x) < 0$ when $-2 < x < 2$

$f''(x) > 0$ when $-\sqrt{2} < x < 0$ or $x > \sqrt{2}$

$f''(x) < 0$ when $x < -\sqrt{2}$ or $0 < x < \sqrt{2}$

Group 2 problems:

596/ **25.** $\lim_{x \to -4} \frac{x^3 + 64}{x + 4}$

621/ *In Problems 1–10 find the slope of the tangent line to the graph of f at the given point. Then find an equation of this tangent line. For Problems 1–4 also graph f and the tangent line.*

1. $f(x) = 2x^2$ at $(-1, 2)$

628/ *In Problems 27–32 determine whether the function f is continuous at c.*

27. $f(x) = \begin{cases} \frac{x^2 - 16}{x - 4} & \text{if } x \neq 4 \\ 8 & \text{if } x = 4 \end{cases} \qquad c = 4$

640/ *In Problems 73–82 find the value of the derivative at the indicated point.*

75. $y = \sqrt{x}$, at $(4, 2)$

663/ *In Problems 15–30 find the derivative of each function.*

15. $f(x) = \frac{x}{x + 1}$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

13. $\frac{1}{x^2} - \frac{1}{y^2} = 4$

704/ *In Problems 1–16 find f' and f''.*

3. $f(x) = 3x^2 + x - 2$

710/ *In Problems 47–50 find $f'(x)$ and $f''(x)$. Find all numbers x for which $f'(x) = 0$, and calculate $f''(x)$ at these numbers.*

49. $f(x) = (x^2 - 1)^{3/2}$

740/ *In Problems 27–46 follow the seven steps on page 731 to graph f.*

29. $f(x) = x^4 - 2x^2 + 1$

740/ *In Problems 47–54 determine where $f'(x) = 0$. Use the Second Derivative Test to determine the local maxima and local minima of each function.*

49. $f(x) = 3x^4 + 4x^3 - 3$

800/ **15.** $\int (x^3 - 2x^2 + x - 1)\, dx$

806/ *In Problems 1–34 evaluate each indefinite integral. Use the substitution method.*

11. $\int (x^3 - 1)^4 x^2\, dx$

823/ **9.** $\int_{-2}^{3} (x - 1)(x + 3)\, dx$

823/ **25.** $\int_{1}^{3} \frac{dx}{x + 1}$

836/ *In Problems 11–28 find the area enclosed by the graphs of the given functions and lines. Draw a sketch first.*

19. $f(x) = x^2, \quad g(x) = x^4$

849/ *In Problems 1–14 evaluate each indefinite integral. Use integration by parts.*

1. $\int xe^{2x}\, dx$

861/ *In Problems 1–10 find the average value of each function f over the given interval.*

3. $f(x) = 1 - x^2$, over $[-1, 1]$

869/ **15. Defective Parts** A machine produces parts to meet certain specifications, and the probability that a part is defective is .05. A sample of 50 parts is taken. What is the probability that it will have 2 or more defective parts? Compute this probability, using both the Poisson and the binomial probability functions.

878/ *In Problems 17–24 compute the expected value for each probability density function.*

21. $f(x) = \frac{3}{250}(10x - x^2)$, over $[0, 5]$

879/ **29. Psychological Testing** Let T be the random variable that a subject in a psychological testing program will make a certain choice after t seconds. If the probability density function is

$$f(t) = 0.4e^{-0.4t}$$

what is the probability that the subject will make the choice in less than 5 seconds?

899/ *In Problems 7–16 find f_x, f_y, f_{xx}, f_{yy}, f_{yx}, and f_{xy}.*

7. $f(x, y) = y^3 - 2xy + y^2 - 12x^2$

905/ *In Problems 7–24 find all critical points and determine whether they are a local maximum, a local minimum, or a saddle point.*

11. $f(x, y) = x^2 - y^2 + 4x + 8y$

912/ *In Problems 1–12 use the method of Lagrange multipliers.*

3. Find the minimum value of $z = f(x, y) = x^2 + y^2$ subject to the constraint $g(x, y) = x + y - 1 = 0$.

Group 3 problems:

604/ **1.** $\lim_{x \to \infty} \dfrac{x^3 + x^2 + 2x - 1}{x^3 + x + 1}$

604/ **6.** $\lim_{x \to -\infty} \dfrac{x^2 - 2x + 1}{x^3 + 5x + 4}$

640/ *In Problems 73–82 find the value of the derivative at the indicated point.*

77. $y = 1/\sqrt[3]{x}$, at $(-8, -\frac{1}{2})$

663/ *In Problems 15–30 find the derivative of each function.*

17. $f(x) = \dfrac{3x + 4}{2x - 1}$

686/ *In Problems 1–52 find the derivative of each function.*

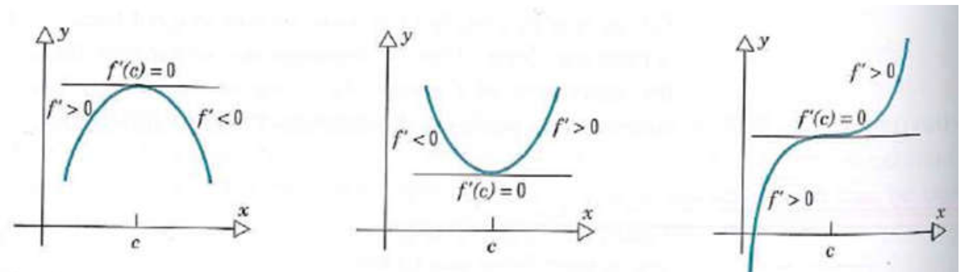
19. $f(x) = e^{-3x} - 3x$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

15. $\dfrac{1}{x} + \dfrac{1}{y} = 2$

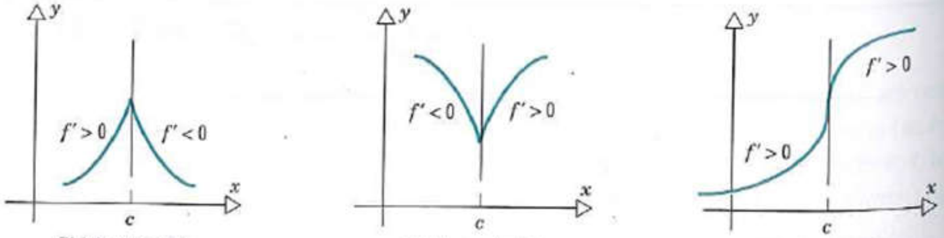
714/

Figure 4



Critical point is a local maximum | Critical point is a local minimum | Critical point is neither local maximum nor a local minimum

Figure 5



f'(c) does not exist
Critical point is a local maximum

f'(c) does not exist
Critical point is a local minimum

f'(c) does not exist
Critical point is neither a local maximum nor a local minimum

740/ *In Problems 27–46 follow the seven steps on page 731 to graph f.*

31. $f(x) = x^5 - 10x^4$

741/ **63. Demand Equation** The cost function and demand equation for a certain product are

$$C(x) = 50x + 40{,}000$$
$$p = d(x) = 100 - 0.01x$$

Find

(a) The revenue function
(b) The maximum revenue
(c) The profit function
(d) The maximum profit

750/ *In Problems 1–4 locate all horizontal asymptotes, if any, of the function f.*

1. $f(x) = \dfrac{x^3 + x^2 + 2x - 1}{x^3 + x + 1}$

750/ *In Problems 5–8 locate all vertical asymptotes, if any, of the function f.*

6. $f(x) = \dfrac{3x^2 - 1}{x + 1}$

800/ *In Problems 31–34 find the revenue function. Assume that revenue is zero when zero units are sold.*

33. $R'(x) = 20x + 5$

823/ **11.** $\int_1^2 \frac{x^2 - 1}{x^4}\, dx$

823/ **29.** $\int_0^3 \frac{\ln(x + 1)}{x + 1}\, dx$

836/ *In Problems 11–28 find the area enclosed by the graphs of the given functions and lines. Draw a sketch first.*

21. $f(x) = x^2 - 4x, \quad g(x) = -x^2$

861/ *In Problems 1–10 find the average value of each function f over the given interval.*

5. $f(x) = 3x$, over $[1, 5]$

869/ *In Problems 9–12 find each probability. Assume X is a Poisson random variable with $np = 6$.*

9. $P(X \leq 5)$

878/ *In Problems 17–24 compute the expected value for each probability density function.*

17. $f(x) = \frac{1}{2}$, over $[0, 2]$

879/ **31. Learning Time** A manufacturer of educational games for children finds through extensive psychological research that the average time it takes for a child in a certain age group to learn the rules of the game is predicted by a **beta probability density function,**

$$f(x) = \begin{cases} \frac{1}{4500}(30x - x^2) & \text{if } 0 \leq x \leq 30 \\ 0 & \text{if } x < 0 \text{ or } x > 30 \end{cases}$$

where x is the time in minutes. What is the probability a child will learn how to play the game within 10 minutes? What is the probability a child will learn the game after 20 minutes? What is the probability the game is learned in at least 10 minutes, but no more than 20 minutes?

899/ *In Problems 31–38 find the slope of the tangent line to the curve of intersection of the surface $z = f(x, y)$ with the given plane at the indicated point.*

31. $z = f(x, y) = 5x^2 + 3y^2$; plane: $y = 3$; point: $(2, 3, 47)$

905/ *In Problems 7–24 find all critical points and determine whether they are a local maximum, a local minimum, or a saddle point.*

15. $f(x, y) = x^2 + y^2 + xy - 6x + 6$

912/ *In Problems 1–12 use the method of Lagrange multipliers.*

5. Find the maximum value of $z = f(x, y) = 12xy - 3y^2 - x^2$ subject to the constraint $g(x, y) = x + y - 16 = 0$.

Group 4 problems:

596/ **33.** $\lim_{x\to 0} \frac{4x^3 - 3x}{x^2 - x}$

622/ *In Problems 1–10 find the slope of the tangent line to the graph of f at the given point. Then find an equation of this tangent line. For Problems 1–4 also graph f and the tangent line.*

5. $f(x) = x^2 + x$ at (2, 6)

622/ *In Problems 21–30 find the derivative of f. Use formula (4).*
(limit definition of derivative)

25. $f(x) = 3x^2 - 2x + 1$

628/ *In Problems 27–32 determine whether the function f is continuous at c.*

29. $f(x) = \begin{cases} \frac{x^3 - 8}{x - 2} & \text{if } x \neq 2 \\ 4 & \text{if } x = 2 \end{cases} \quad c = 2$

663/ *In Problems 15–30 find the derivative of each function.*

19. $f(x) = \frac{x^2}{x - 4}$

686/ *In Problems 1–52 find the derivative of each function.*

21. $f(x) = \frac{e^{3x} - e^{-x}}{e^x}$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

17. $\frac{x}{y} + \frac{y}{x} = 6$

710/ *In Problems 5–40 find the derivative of each function.*

35. $f(x) = e^{2x^2+5}$

710/ *In Problems 47–50 find f ′(x) and f″(x). Find all numbers x for which f ′(x) = 0, and calculate f″(x) at these numbers.*

50. $f(x) = (x^2 + 1)^{3/2}$

740/ **55.** Sketch the graph of a function $y = f(x)$ that is continuous for all x and has the following properties:

1. (0, 10), (6, 15), and (10, 0) are on the graph.
2. $f'(6) = 0$ and $f'(10) = 0$; $f'(x)$ is not 0 anywhere else.
3. $f''(x) < 0$ for $x < 9$, $f''(9) = 0$, and $f''(x) > 0$ for $x > 9$.

750/ *In Problems 15–24 graph each function.*

20. $f(x) = \frac{2x}{x^2 - 4}$

741/ **65. Demand Equation** The demand equation for a certain commodity is

$$p = d(x) = 10 + \frac{40}{x} \qquad 1 \le x \le 10$$

where p is the price in dollars when x units are demanded. Find

(a) The revenue function
(b) The number x of units demanded that maximizes revenue
(c) The maximum revenue

800/ **17.** $\int \left(\frac{x-1}{x}\right) dx$

806/ *In Problems 1–34 evaluate each indefinite integral. Use the substitution method.*

13. $\int \frac{x}{\sqrt[5]{1-x^2}}\, dx$

823/ **13.** $\int_1^4 \left(\sqrt[5]{t^2} + \frac{1}{t}\right) dt$

836/ *In Problems 11–28 find the area enclosed by the graphs of the given functions and lines. Draw a sketch first.*

23. $f(x) = 4 - x^2, \quad g(x) = x + 2$

861(2)/ *In Problems 1–10 find the average value of each function f over the given interval.*

7. $f(x) = -5x^4 + 4x - 10, \quad$ over $[-2, 2]$

869/ *In Problems 9–12 find each probability. Assume X is a Poisson random variable with np = 6.*

11. $P(X = 5)$

878/ *In Problems 17–24 compute the expected value for each probability density function.*

23. $f(x) = \frac{1}{x}, \quad$ over $[1, e]$

882/ **9.** Suppose the outcome X of an experiment lies between 0 and 2, and the probability density function for X is $f(x) = \frac{1}{2}x$. Find

(a) $P(X \le 1)$
(b) $P(1 \le X \le 1.5)$
(c) $P(1.5 \le X)$

899/ *In Problems 31–38 find the slope of the tangent line to the curve of intersection of the surface $z = f(x, y)$ with the given plane at the indicated point.*

33. $z = f(x, y) = \sqrt{16 - x^2 - y^2}$; plane: $x = 1$; point: $(1, 2, \sqrt{11})$

905/ *In Problems 7–24 find all critical points and determine whether they are a local maximum, a local minimum, or a saddle point.*

19. $f(x, y) = x^3 - 6xy + y^3$

912/ *In Problems 1–12 use the method of Lagrange multipliers.*

7. Find the minimum value of $z = f(x, y) = 5x^2 + 6y^2 - xy$ subject to the constraint $g(x, y) = x + 2y - 24 = 0$.

Group 5 problems:

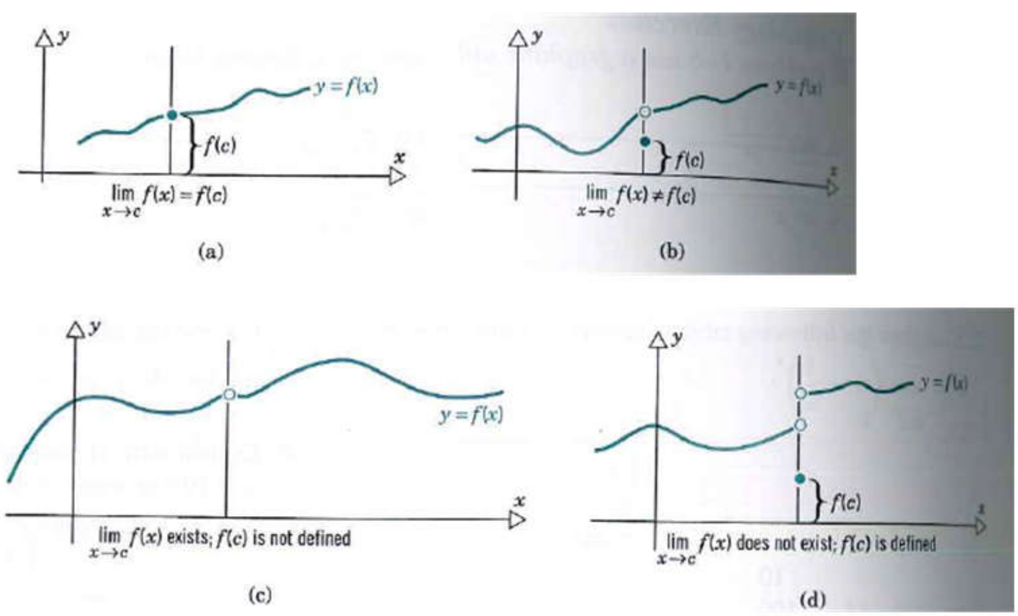
In Problems 19–36 determine whether $\lim_{x \to c} f(x)$ exists by graphing the function. If it exists, find $\lim_{x \to c} f(x)$.

586/ **33.** $f(x) = \begin{cases} 3x - 1 & \text{if } x < 1 \\ \text{Not defined} & \text{if } x = 1 \\ 2x & \text{if } x > 1 \end{cases} \quad c = 1$

604/ **3.** $\lim_{x \to \infty} \dfrac{2x + 4}{x - 1}$

604/ **7.** $\lim_{x \to -\infty} \dfrac{5x^3 - 1}{x^2 + 1}$

606/Figure 20. Which functions are continuous?



611/ *In Problems 1–14 determine whether the function f is continuous at c.*

11. $f(x) = \begin{cases} x^2 & \text{if } x \le 0 \\ 2x & \text{if } x > 0 \end{cases} \quad c = 0$

663/ *In Problems 15–30 find the derivative of each function.*

21. $f(x) = \dfrac{2x + 1}{3x^2 + 4}$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

19. $x^2 = \dfrac{y^2}{y^2 - 1}$

704/ *In Problems 1–16 find f ′ and f″.*

5. $f(x) = -3x^4 + 2x^2$

740/ **57.** Sketch the graph of a function $y = f(x)$ that is continuous for all x and has the following properties:

1. (1, 5), (2, 3), and (3, 1) are on the graph.
2. $f'(1) = 0$ and $f'(3) = 0$; $f'(x)$ is not 0 anywhere else.
3. $f''(x) < 0$ for $x < 2$, $f''(2) = 0$, and $f''(x) > 0$ for $x > 2$.

800/ *In Problems 35–38 find the cost function and determine where the cost is a minimum.*

35. $C'(x) = 14x - 2800$
Fixed cost = $4300

806/ *In Problems 1–34 evaluate each indefinite integral. Use the substitution method.*

14. $\int x\sqrt{x + 3}\, dx$

813/ *In Problems 9–18 find the particular solution of each differential equation, using the indicated boundary condition.*

15. $\dfrac{dy}{dx} = e^x$

$y = 4$ when $x = 0$

823/ **15.** $\int_1^4 \frac{x+1}{\sqrt{x}}\,dx$

836/ *In Problems 11–28 find the area enclosed by the graphs of the given functions and lines. Draw a sketch first.*

25. $f(x) = x^3, \quad g(x) = 4x$

849/ *In Problems 15–30 evaluate each definite integral by using the method of integration by parts.*

22. $\int_1^2 x \ln x dx$

861(2)/ *In Problems 1–10 find the average value of each function f over the given interval.*

9. $f(x) = e^x$, over $[0, 1]$

867/Example 4

A department store has found that the daily demand for color television sets averages 3 in 100 customers. On a given day, 50 appliances are sold. What is the probability that more than 3 of the 50 sales are requests for television sets?

873/Example 1

Show that the function $f(x) = \frac{3}{56}(5x - x^2)$ is a probability density function over the interval [0, 4].

878(9) **33. Cost Estimate** The probability density function that gives the probability that an electrical contractor's cost estimate is off by x percent is

$$f(x) = \frac{3}{56}(5x - x^2)$$

for x in the interval [0, 4]. On average, by what percent can the contractor be expected to be off?

890(1)/ *In Problems 35–48 find the domain of each function.*

47. $w = f(x, y, z) = \frac{4}{x^2 + y^2 + z^2}$

905/ *In Problems 7–24 find all critical points and determine whether they are a local maximum, a local minimum, or a saddle point.*

21. $f(x, y) = x^3 + x^2y + y^2$

921/ **9.** Use the method of Lagrange multipliers to find the maximum value of each of the following functions $z = f(x, y)$, subject to the constraint $g(x, y) = 0$:

(a) $f(x, y) = 5x^2 - 3y^2 + xy$
$g(x, y) = 2x - y - 20 = 0$

Group 6 problems:

596/ **35.** $\lim_{x \to 1} \frac{x^4 - 1}{x - 1}$

611/ *In Problems 1–14 determine whether the function f is continuous at c.*

13. $f(x) = \begin{cases} 4 - 3x^2 & \text{if } x < 0 \\ 4 & \text{if } x = 0 \\ \sqrt{16 - x^2} & \text{if } 0 < x < 4 \end{cases} \qquad c = 0$

622/ *In Problems 1–10 find the slope of the tangent line to the graph of f at the given point. Then find an equation of this tangent line. For Problems 1–4 also graph f and the tangent line.*

7. $f(x) = -x^2 + 4x$ at $(1, 3)$

628/ *In Problems 27–32 determine whether the function f is continuous at c.*

31. $f(x) = \begin{cases} 2x^2 + 1 & \text{if } x < 0 \\ 1 & \text{if } x = 0 \\ x^2 + 1 & \text{if } x > 0 \end{cases} \qquad c = 0$

641/ *In Problems 73–82 find the value of the derivative at the indicated point.*

81. $y = 2 - 2/x^3$, at $(2, \frac{7}{4})$

664/ *In Problems 15–30 find the derivative of each function.*

25. $f(x) = 1 + \frac{1}{x} + \frac{1}{x^2}$

686/ *In Problems 1–52 find the derivative of each function.*

25. $f(x) = \frac{e^x}{x}$

696/ *In Problems 1–32 find dy/dx by using implicit differentiation.*

21. $(2x + 3y)^2 = x^2 + y^2$

740/ *In Problems 47–54 determine where $f'(x) = 0$. Use the Second Derivative Test to determine the local maxima and local minima of each function.*

51. $f(x) = x^5 - 5x^4 + 2$

741/ **72. Profit Function** A company estimates that the profit $P(x)$ is related to the selling price x of an item by

$$P(x) = 15x^2 - 100 - \tfrac{1}{3}x^3$$

(a) Determine where profit is increasing.
(b) What selling price results in maximum profit?

750/ *In Problems 9–14 locate all horizontal and vertical asymptotes, if any, of the function f.*

13. $f(x) = \dfrac{x^2}{x^2 - 4}$

800/ **19.** $\displaystyle\int \left(2e^x - \frac{3}{x}\right) dx$

800/ *In Problems 35–38 find the cost function and determine where the cost is a minimum.*

37. $C'(x) = 20x - 8000$
Fixed cost = \$500

813/ *In Problems 9–18 find the particular solution of each differential equation, using the indicated boundary condition.*

17. $\dfrac{dy}{dx} = \dfrac{x^2 + x + 1}{x}$
$y = 0$ when $x = 1$

882/ **1.** Find the average value of $f(x) = x^3$ over the interval $[0, 1]$.

867/Example 5

Weather records show that, of the 30 days in November, on the average 3 days are snowy. What is the probability that November of next year will have at most 4 snowy days? Use a Poisson model.

874/Example 2

Compute the probability that the random variable X with probability density function $\frac{3}{56}(5x - x^2)$ assumes values between 1 and 2.

879(7)/Example 6

A passenger arrives at a train terminal where trains arrive every 40 minutes. Determine the expected waiting time by using a uniform density function.

899/ *In Problems 7–16 find f_x, f_y, f_{xx}, f_{yy}, f_{yx}, and f_{xy}.*

15. $f(x, y) = \dfrac{10 - x + 2y}{xy}$

921/ **7.** For each of the following surfaces, find all local maxima, local minima, and saddle points:

(a) $z = f(x, y) = xy - 6x - x^2 - y^2$

921/ **9.** Use the method of Lagrange multipliers to find the maximum value of each of the following functions $z = f(x, y)$, subject to the constraint $g(x, y) = 0$:

(b) $f(x, y) = x\sqrt{y}$
$g(x, y) = 2x + y - 3000 = 0$