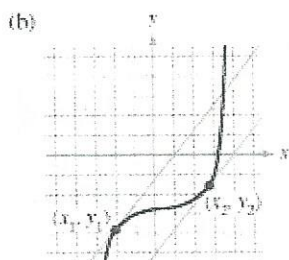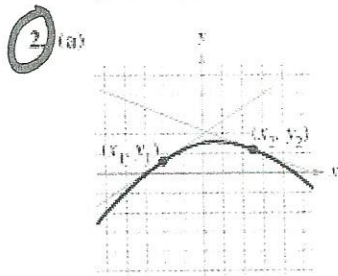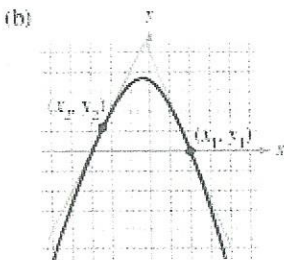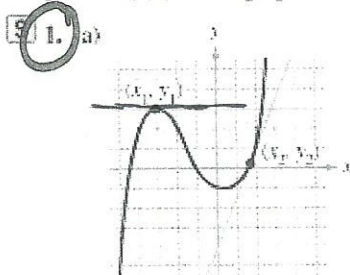SECTION 2.1   The Derivative and the Tangent Line

Exercises for Section 2.1

The symbol ⊞ indicates an exercise in which you are instructed to use graphing technology or a symbolic computer algebra system.
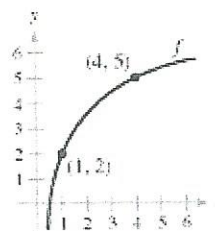
Click on $\boxed{S}$ to view the complete solution of the exercise.

Click on $\boxed{M}$ to print an enlarged copy of the graph.

In Exercises 1 and 2, estimate the slope of the graph at the points (x_1, y_1) and (x_2, y_2).

1. (a)

(b)

2. (a)

(b)

In Exercises 3 and 4, use the graph sho
To print an enlarged copy of the graph, sele
button.

$\boxed{M}$ $\boxed{S}$ 3. Identify or sketch each of the quantities on t

(a) $f(1)$ and $f(4)$ (b) $f(4) - f$

(c) $y = \dfrac{f(4) - f(1)}{4 - 1}(x - 1) + f(1)$

$\boxed{M}$ 4. Insert the proper inequality symbol (< or >
quantities.

(a) $\dfrac{f(4) - f(1)}{4 - 1}$ $\dfrac{f(4) - f(3)}{4 - 3}$

(b) $\dfrac{f(4) - f(1)}{4 - 1}$ $f'(1)$

104   CHAPTER 2   Differentiation

In Exercises 5–10, find the slope of the tangent line to the graph of the function at the given point.

5. $f(x) = 3 - 2x$, $(-1, 5)$ 6. $g(x) = \frac{3}{2}x - 1$, $(-2, -2)$

7. $g(x) = x^2 - 4$, $(1, -3)$ 8. $g(x) = 5 - x^2$, $(2, 1)$

9. $f(t) = 3t - t^2$, $(0, 0)$ 10. $h(t) = t^2 + 3$, $(-2, 7)$

In Exercises 11–24, find the derivative by the limit process.

11. $f(x) = 3$ 12. $g(x) = -5$

13. $f(x) = -5x$ 14. $f(x) = 3x + 2$

15. $h(s) = 3 + \frac{2}{3}s$ 16. $f(x) = 9 - \frac{1}{2}x$

17. $f(x) = 2x^2 + x - 1$ 18. $f(x) = 1 - x^2$

19. $f(x) = x^3 - 12x$ 20. $f(x) = x^3 - x^2$

21. $f(x) = \dfrac{1}{x - 1}$ 22. $f(x) = \dfrac{1}{x^2}$

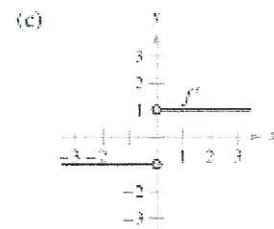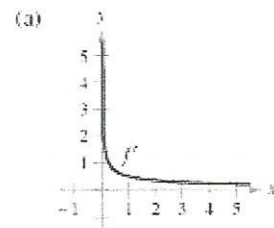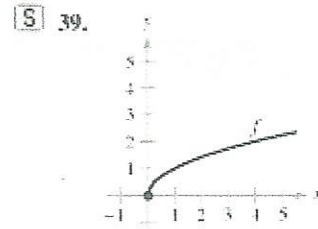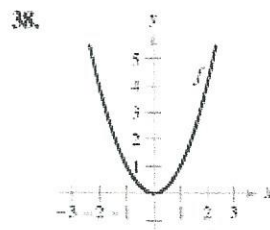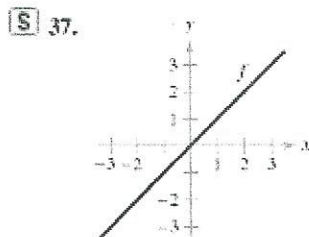23. $f(x) = \sqrt{x + 1}$ 24. $f(x) = \dfrac{4}{\sqrt{x}}$

In Exercises 25–32, (a) find an equation of the tangent line to the graph of f at the given point, (b) use a graphing utility to graph the function and its tangent line at the point, and (c) use the *derivative* feature of a graphing utility to confirm your results.

[handwritten: 25–31(a) odd + 32]

25. $f(x) = x^2 + 1$, $(2, 5)$

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

27. $f(x) = x^3$, $(2, 8)$ 28. $f(x) = x^3 + 1$, $(1, 2)$

29. $f(x) = \sqrt{x}$, $(1, 1)$ 30. $f(x) = \sqrt{x - 1}$, $(5, 2)$

31. $f(x) = x + \dfrac{4}{x}$, $(4, 5)$ 32. $f(x) = \dfrac{1}{x + 1}$, $(0, 1)$

In Exercises 33–36, find an equation of the line that is tangent to the graph of f *and* parallel to the given line.

[handwritten: 33 & 35]

Function	Line
33. $f(x) = x^3$	$3x - y + 1 = 0$
34. $f(x) = x^3 + 2$	$3x - y - 4 = 0$
35. $f(x) = \dfrac{1}{\sqrt{x}}$	$x + 2y - 6 = 0$
36. $f(x) = \dfrac{1}{\sqrt{x - 1}}$	$x + 2y + 7 = 0$

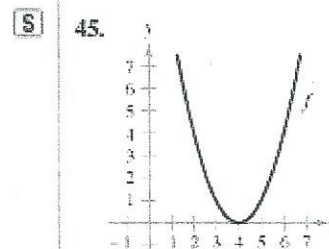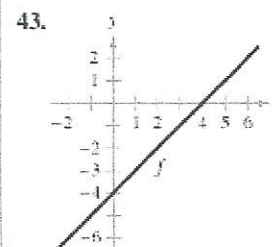In Exercises 37–40, the graph of f is given. Select the graph of f'.

37.

38.

39.

40.

(a)

(b)

(c)

(d)

41. The tangent line to the graph of $y = g(x)$ passes through the point $(9, 0)$. Find $g(5)$ a

42. The tangent line to the graph of $y = h(x)$ passes through the point $(3, 6)$. Find $h(-1)$

Writing About Concepts

In Exercises 43–46, sketch the graph of f'. found your answer.

43.

44.

45.

46.

47. Sketch a graph of a function whose de negative.