

## Exercise 11-3

The answers to most of the problems in this exercise set contain both an unsimplified form and a simplified form of the derivative. When checking your work, first check that you applied the rules correctly, and then check that you performed the algebraic simplification correctly. Unless instructed otherwise, when differentiating a product, use the product rule rather than performing the multiplication first.

**A** In Problems 1–26, find  $f'(x)$  and simplify.

1.  $f(x) = 2x^3(x^2 - 2)$
2.  $f(x) = 5x^2(x^3 + 2)$
3.  $f(x) = (x - 3)(2x - 1)$
4.  $f(x) = (3x + 2)(4x - 5)$
5.  $f(x) = \frac{x}{x - 3}$
6.  $f(x) = \frac{3x}{2x + 1}$
7.  $f(x) = \frac{2x + 3}{x - 2}$
8.  $f(x) = \frac{3x - 4}{2x + 3}$
9.  $f(x) = 3xe^x$
10.  $f(x) = x^2e^x$
11.  $f(x) = x^3 \ln x$
12.  $f(x) = 5x \ln x$
13.  $f(x) = (x^2 + 1)(2x - 3)$
14.  $f(x) = (3x + 5)(x^2 - 3)$
15.  $f(x) = (0.4x + 2)(0.5x - 5)$
16.  $f(x) = (0.5x - 4)(0.2x + 1)$
17.  $f(x) = \frac{x^2 + 1}{2x - 3}$
18.  $f(x) = \frac{3x + 5}{x^2 - 3}$
19.  $f(x) = (x^2 + 2)(x^2 - 3)$
20.  $f(x) = (x^2 - 4)(x^2 + 5)$
21.  $f(x) = \frac{x^2 + 2}{x^2 - 3}$
22.  $f(x) = \frac{x^2 - 4}{x^2 + 5}$
23.  $f(x) = \frac{e^x}{x^2 + 1}$
24.  $f(x) = \frac{1 - e^x}{1 + e^x}$
25.  $f(x) = \frac{\ln x}{1 + x}$
26.  $f(x) = \frac{2x}{1 + \ln x}$

In Problems 27–38, find  $h'(x)$ , where  $f(x)$  is an unspecified differentiable function.

27.  $h(x) = xf(x)$
28.  $h(x) = x^2f(x)$
29.  $h(x) = x^3f(x)$
30.  $h(x) = \frac{f(x)}{x}$
31.  $h(x) = \frac{f(x)}{x^2}$
32.  $h(x) = \frac{f(x)}{x^3}$
33.  $h(x) = \frac{x}{f(x)}$
34.  $h(x) = \frac{x^2}{f(x)}$
35.  $h(x) = e^xf(x)$
36.  $h(x) = \frac{e^x}{f(x)}$
37.  $h(x) = \frac{\ln x}{f(x)}$
38.  $h(x) = \frac{f(x)}{\ln x}$

**B** In Problems 39–48, find the indicated derivatives and simplify.

39.  $f'(x)$  for  $f(x) = (2x + 1)(x^2 - 3x)$
40.  $y'$  for  $y = (x^3 + 2x^2)(3x - 1)$

41.  $\frac{dy}{dt}$  for  $y = (2.5t - t^2)(4t + 1.4)$

42.  $\frac{d}{dt}[(3 - 0.4t^3)(0.5t^2 - 2t)]$

43.  $y'$  for  $y = \frac{5x - 3}{x^2 + 2x}$

44.  $f'(x)$  for  $f(x) = \frac{3x^2}{2x - 1}$

45.  $\frac{d}{dw} \frac{w^2 - 3w + 1}{w^2 - 1}$

46.  $\frac{dy}{dw}$  for  $y = \frac{w^4 - w^3}{3w - 1}$

47.  $y'$  for  $y = (1 + x - x^2)e^x$

48.  $\frac{dy}{dt}$  for  $y = (1 + e^t) \ln t$

In Problems 49–54, find  $f'(x)$  and find the equation of the line tangent to the graph of  $f$  at  $x = 2$ .

49.  $f(x) = (1 + 3x)(5 - 2x)$

50.  $f(x) = (7 - 3x)(1 + 2x)$

51.  $f(x) = \frac{x - 8}{3x - 4}$

52.  $f(x) = \frac{2x - 5}{2x - 3}$

53.  $f(x) = \frac{x}{2^x}$

54.  $f(x) = (x - 2) \ln x$

In Problems 55–58, find  $f'(x)$  and find the value(s) of  $x$  where  $f'(x) = 0$ .

55.  $f(x) = (2x - 15)(x^2 + 18)$

56.  $f(x) = (2x - 3)(x^2 - 6)$

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

58.  $f(x) = \frac{x}{x^2 + 9}$

In Problems 59–62, find  $f'(x)$  in two ways: by using the product or quotient rule and by simplifying first.

59.  $f(x) = x^3(x^4 - 1)$

60.  $f(x) = x^4(x^3 - 1)$

61.  $f(x) = \frac{x^3 + 9}{x^3}$

62.  $f(x) = \frac{x^4 + 4}{x^4}$

**C** In Problems 63–82, find each indicated derivative and simplify.

63.  $f(w) = (w + 1)2^w$

64.  $g(w) = (w - 5) \log_3 w$

65.  $\frac{d}{dx} \frac{3x^2 - 2x + 3}{4x^2 + 5x - 1}$

66.  $y'$  for  $y = \frac{x^3 - 3x + 4}{2x^2 + 3x - 2}$

67.  $\frac{dy}{dx}$  for  $y = 9x^{1/3}(x^3 + 5)$

68.  $\frac{d}{dx}[(4x^{1/2} - 1)(3x^{1/3} + 2)]$

69.  $y'$  for  $y = \frac{\log_2 x}{1 + x^2}$

70.  $\frac{dy}{dx}$  for  $y = \frac{10^x}{1 + x^4}$

71.  $f'(x)$  for  $f(x) = \frac{6\sqrt[3]{x}}{x^2 - 3}$