

3.1 Exercises

In Exercises 1–5, find $f'(x)$ two ways: (1) multiply the factors first, then find the derivative, and (2) use the Product Rule.

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

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

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

4. $f(x) = x^{\frac{1}{2}}\left(1 + x^{\frac{1}{2}} - x^{\frac{3}{2}}\right)$

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

In Exercises 6–10, find $g'(x)$ two ways: (1) divide the factors first, then find the derivative; and (2) use the Quotient Rule and simplify the answer.

6. $g(x) = \frac{1 + 5x + x^2}{x}$

7. $g(x) = \frac{2 + \sqrt{x}}{\sqrt{x}}$

8. $g(x) = \frac{x^2 + 1}{x^5}$

9. $g(x) = \frac{30x^2 - 10x^6}{5x}$

10. $g(x) = \frac{3x^{\frac{1}{2}} - 5x^{\frac{3}{2}} + 7x^{\frac{5}{2}} - 9x^{\frac{7}{2}}}{x^{\frac{1}{2}}}$

In Exercises 11–34, use the Product Rule or Quotient Rule to find the derivative of each of the functions. Simplify your answers.

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

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

13. $f(t) = t^{\frac{1}{2}}(4t + 3)$

14. $f(t) = t^{\frac{2}{3}}(4t^2 + 1)$

15. $y = x^2\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$

16. $y = x^{-2}\left(3x + x^{\frac{1}{3}}\right)$

17. $g(u) = (2u^2 + 3)(5 - 3u)$

18. $g(u) = (3u^2 - 8)(u^2 + u)$

19. $g(t) = \left(5 + \frac{1}{t}\right)\left(t^2 + \frac{1}{5}\right)$

20. $f(t) = \left(1 - \frac{3}{t^2}\right)(2t^2 + t - 1)$

21. $f(x) = \frac{3x}{x + 6}$

22. $f(x) = \frac{7x^2}{2x - 1}$

23. $f(x) = \frac{x + 8}{x - 7}$

24. $f(x) = \frac{x^2 + 2x - 3}{x + 2}$

25. $y = \frac{x^3 - 5}{x^2 + 1}$

26. $y = \frac{2x^2 + 3x}{x^3 + 6}$

27. $g(x) = \frac{\sqrt{x}}{x + 9}$

28. $g(x) = \frac{6\sqrt{x}}{3x - 4}$

29. $f(u) = \frac{u^2}{\sqrt{u} + 1}$

30. $f(u) = \frac{7}{1 - \sqrt[3]{u}}$

31. $f(t) = \frac{4 - \sqrt{t}}{t^2 + 3}$

32. $f(t) = \frac{3 - t}{4 - 5\sqrt{t}}$