At the beginning of this section we listed a few other ways to denote the derivative. A more complete list of commonly used notations is as follows:

$$f'(x),\ y',\ \frac{dy}{dx},\ \frac{d}{dx}f(x), f_x,\ D_x(f(x)),\ \text{and}\ f'.$$

Example 6: Using Derivative Notation

Find $D_x(h(x))$ where $h(x) = \frac{18}{x^{\frac{2}{3}}}$.

Solution

$$h(x) = \frac{18}{x^{\frac{2}{3}}} = 18x^{-\frac{2}{3}}$$

Rewrite the expression to be a polynomial-like function.

$$D_x(h(x)) = D_x\left(18x^{-\frac{2}{3}}\right) = h'(x) = 18\cdot\left(-\frac{2}{3}\cdot x^{-\frac{2}{3}-1}\right)$$
$$= \frac{-18(2)}{3}x^{-\frac{5}{3}}$$
$$= -12x^{-\frac{5}{3}}$$

Use the Power Rule with $c = 18$ and $r = -\frac{2}{3}$ to find the derivative.

2.7 EXERCISES

PRACTICE

In Exercises 1–10, use the definition of the derivative to find $f'(x)$.

1. $f(x) = 10$

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

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

4. $f(x) = 6x^2$

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

6. $f(x) = \frac{1}{2}x^2 + 3x - 9$

7. $f(x) = x^3 - 4$

8. $f(x) = \frac{1}{3}x - x^3$

9. $f(x) = -\frac{1}{x}$

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

Use the rules of differentiation learned so far to find the derivative for each of the functions in Exercises 11–32.

11. $f(x) = 4$

12. $f(x) = 3x$

13. $f(x) = 7x - 2$

14. $y = 12$

15. $y = -x$

16. $y = x + 3$

17. $y = 4x^2$

18. $y = -\frac{8}{7}x^7$

19. $y = \frac{7}{x}$

20. $y = \frac{4}{x^5}$

21. $y = \frac{1}{2x^3}$

22. $g(x) = \frac{4}{3x^2}$

23. $g(x) = 3\sqrt{x}$

24. $h(x) = 2\sqrt[3]{x}$

25. $h(t) = t^{2.3}$

26. $h(t) = t^{-1.4}$

27. $f(x) = 3x^{0.8}$

28. $f(u) = 2u^{0.1}$

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

30. $f(x) = \frac{2}{\sqrt[4]{x}}$

31. $f(x) = -5x^{\frac{3}{4}}$

32. $f(x) = 6x^{-\frac{2}{3}}$