

Before you begin the exercise set, be sure you realize that one of the most important steps in integration is *rewriting the integrand* in a form that fits the basic integration rules. To further illustrate this point, here are some additional examples.

<u>Original Integral</u>	<u>Rewrite</u>	<u>Integrate</u>	<u>Simplify</u>
$\int \frac{2}{\sqrt{x}} dx$	$2 \int x^{-1/2} dx$	$2 \left( \frac{x^{1/2}}{1/2} \right) + C$	$4x^{1/2} + C$
$\int (t^2 + 1)^2 dt$	$\int (t^4 + 2t^2 + 1) dt$	$\frac{t^5}{5} + 2 \left( \frac{t^3}{3} \right) + t + C$	$\frac{1}{5}t^5 + \frac{2}{3}t^3 + t + C$
$\int \frac{x^3 + 3}{x^2} dx$	$\int (x + 3x^{-2}) dx$	$\frac{x^2}{2} + 3 \left( \frac{x^{-1}}{-1} \right) + C$	$\frac{1}{2}x^2 - \frac{3}{x} + C$
$\int \sqrt[3]{x}(x - 4) dx$	$\int (x^{4/3} - 4x^{1/3}) dx$	$\frac{x^{7/3}}{7/3} - 4 \left( \frac{x^{4/3}}{4/3} \right) + C$	$\frac{3}{7}x^{4/3}(x - 7) + C$

**EXERCISES FOR SECTION 4.1**

Exercises 1–4, verify the statement by showing that the derivative of the right side equals the integrand of the left side.

- 1.  $\int \left( -\frac{9}{x^4} \right) dx = \frac{3}{x^3} + C$
- 2.  $\int \left( 4x^3 - \frac{1}{x^2} \right) dx = x^4 + \frac{1}{x} + C$
- 3.  $\int (x - 2)(x + 2) dx = \frac{1}{3}x^3 - 4x + C$
- 4.  $\int \frac{x^2 - 1}{x^{3/2}} dx = \frac{2(x^2 + 3)}{3\sqrt{x}} + C$

Exercises 5–8, find the general solution of the differential equation and check the result by differentiation.

- 5.  $\frac{dy}{dt} = 3t^2$
- 6.  $\frac{dr}{d\theta} = \pi$
- 7.  $\frac{dy}{dx} = x^{3/2}$
- 8.  $\frac{dy}{dx} = 2x^{-3}$

Exercises 9–14, complete the table using Example 3 and the examples at the top of this page as a model.

<u>Original Integral</u>	<u>Rewrite</u>	<u>Integrate</u>	<u>Simplify</u>
$\int \sqrt[3]{x} dx$			
$\int \frac{1}{x^2} dx$			
$\int \frac{1}{x\sqrt{x}} dx$			
$\int x(x^2 + 3) dx$			
$\int \frac{1}{2x^3} dx$			
$\int \frac{1}{(3x)^2} dx$			

In Exercises 15–34, find the indefinite integral and check the result by differentiation.

- 15.  $\int (x + 3) dx$
- 16.  $\int (5 - x) dx$
- 17.  $\int (2x - 3x^2) dx$
- 18.  $\int (4x^3 + 6x^2 - 1) dx$
- 19.  $\int (x^3 + 2) dx$
- 20.  $\int (x^3 - 4x + 2) dx$
- 21.  $\int (x^{3/2} + 2x + 1) dx$
- 22.  $\int \left( \sqrt{x} + \frac{1}{2\sqrt{x}} \right) dx$
- 23.  $\int \sqrt[3]{x^2} dx$
- 24.  $\int (\sqrt[4]{x^3} + 1) dx$
- 25.  $\int \frac{1}{x^3} dx$
- 26.  $\int \frac{1}{x^4} dx$
- 27.  $\int \frac{x^2 + x + 1}{\sqrt{x}} dx$
- 28.  $\int \frac{x^2 + 2x - 3}{x^4} dx$
- 29.  $\int (x + 1)(3x - 2) dx$
- 30.  $\int (2t^2 - 1)^2 dt$
- 31.  $\int y^2\sqrt{y} dy$
- 32.  $\int (1 + 3t)t^2 dt$
- 33.  $\int dx$
- 34.  $\int 3 dt$

In Exercises 35–42, find the indefinite integral and check the result by differentiation.

- 35.  $\int (2 \sin x + 3 \cos x) dx$
- 36.  $\int (t^2 - \sin t) dt$
- 37.  $\int (1 - \csc t \cot t) dt$
- 38.  $\int (\theta^2 + \sec^2 \theta) d\theta$
- 39.  $\int (\sec^2 \theta - \sin \theta) d\theta$
- 40.  $\int \sec y (\tan y - \sec y) dy$
- 41.  $\int (\tan^2 y + 1) dy$
- 42.  $\int \frac{\cos x}{1 - \cos^2 x} dx$