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 illustrate this point further, here are some additional examples.

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

## Exercises for Section 4.1

See www.CalcChat.com for worked-out solutions to odd-numbered exercises.

**In 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. $\int \frac{x^2-1}{x^{3/2}}\,dx = \frac{2(x^2+3)}{3\sqrt{x}}+C$

**In 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. $\frac{dy}{dx}=2x^{-3}$

**In Exercises 9–14, complete the table.**

| *Original Integral* | *Rewrite* | *Integrate* | *Simplify* |
|---|---|---|---|
| 9. $\int \sqrt[3]{x}\,dx$ | | | |
| 10. $\int \frac{1}{x^2}\,dx$ | | | |
| 11. $\int \frac{1}{x\sqrt{x}}\,dx$ | | | |
| 12. $\int x(x^2+3)\,dx$ | | | |
| 13. $\int \frac{1}{2x^3}\,dx$ | | | |
| 14. $\int \frac{1}{(3x)^2}\,dx$ | | | |

**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. $\int \left(\sqrt[4]{x^3}+1\right)dx$
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. $\int \frac{\cos x}{1-\cos^2 x}\,dx$