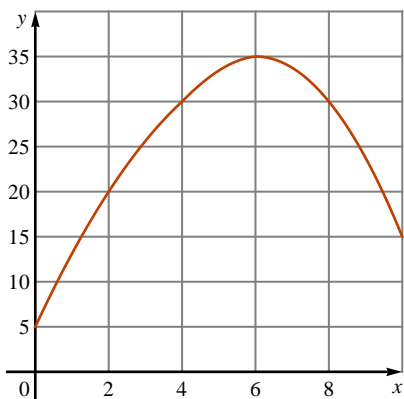


Exercises: Basic Integration

1. The following figure shows the graph of a function $f(x)$.



- (a) Estimate the value of $\int_0^{10} f(x) dx$ using five rectangles and left endpoints.
- (b) Estimate the value of $\int_0^{10} f(x) dx$ using five rectangles and right endpoints.
- (c) Estimate the value of $\int_0^{10} f(x) dx$ using five trapezoids.

2. Estimate the value of $\int_0^2 \sin(\sqrt{x}) dx$ using the following methods. (Round your answers to three decimal places.)

- (a) Four rectangles and left endpoints.
- (b) Four rectangles and right endpoints.
- (c) Four rectangles and midpoints.
- (d) Four trapezoids.

3. Use the following data to estimate $\int_0^{0.5} f(x) dx$.

x	0.0	0.1	0.2	0.3	0.4	0.5
$f(x)$	3.6	2.6	1.8	1.2	0.8	0.6

4. Use the following data to estimate $\int_2^3 f(x) dx$.

x	2.1	2.3	2.5	2.7	2.9
$f(x)$	0.6	0.8	1.1	1.5	2.0

5–7 ■ Write the integral that the given sum approximates.

5. $(5.00)^3(0.01) + (5.01)^3(0.01) + \cdots + (5.99)^3(0.01)$

6. $\sqrt{3.02}(0.02) + \sqrt{3.04}(0.02) + \cdots + \sqrt{5.00}(0.02)$

7. $\frac{2.00}{1+2.00^2}(0.01) + \frac{2.01}{1+2.01^2}(0.01) + \cdots + \frac{3.99}{1+3.99^2}(0.01)$

8–11 ■ Write a sum that approximates the given integral using the indicated method.

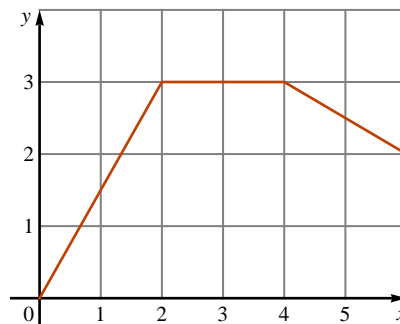
8. $\int_2^3 x^2 dx$ 100 rectangles, left endpoints

9. $\int_0^4 \sin(x) dx$ 200 rectangles, right endpoints

10. $\int_1^2 xe^x dx$ 40 rectangles, left endpoints

11. $\int_3^5 \frac{1}{x} dx$ 20 rectangles, midpoints

12. The following figure shows the graph of a function $f(x)$.



Use this graph to evaluate each of the following integrals.

(a) $\int_2^3 f(x) dx$ (b) $\int_0^2 f(x) dx$ (c) $\int_0^6 f(x) dx$

13–16 ■ Evaluate the given integral by interpreting it as an area.

13. $\int_0^3 2 dx$

14. $\int_0^5 (10-2x) dx$

15. $\int_1^5 x dx$

16. $\int_{-1}^1 \sqrt{1-x^2} dx$

Answers

1. (a) 240 (b) 260 (c) 250 2. (a) 1.216 (b) 1.710 (c) 1.555 (d) 1.463 3. 0.85 4. 1.2 5. $\int_5^6 x^3 dx$

6. $\int_3^5 \sqrt{x} dx$ 7. $\int_2^4 \frac{x}{1+x^2} dx$ 8. $2.00^2(0.01) + 2.01^2(0.01) + 2.02^2(0.01) + \cdots + 2.99^2(0.01)$

9. $\sin(0.02)(0.02) + \sin(0.04)(0.02) + \cdots + \sin(4.00)(0.02)$ 10. $1.000e^{1.000}(0.025) + 1.025e^{1.025}(0.025) + \cdots + 1.975e^{1.975}(0.025)$

11. $\frac{1}{3.05}(0.1) + \frac{1}{3.15}(0.1) + \frac{1}{3.25}(0.1) + \cdots + \frac{1}{4.95}(0.1)$ 12. (a) 3 (b) 3 (c) 14 13. 6 14. 25 15. 12 16. $\pi/2$