

6.5 Exercises

In Exercises 1–28, evaluate the definite integral.

1. $\int_0^2 x(x^2 - 1)^3 dx$ 2. $\int_0^1 x^2(2x^3 - 1)^4 dx$

3. $\int_0^1 x\sqrt{5x^2 + 4} dx$ 4. $\int_1^3 x\sqrt{3x^2 - 2} dx$

5. $\int_0^2 x^2(x^3 + 1)^{3/2} dx$ 6. $\int_1^5 (2x - 1)^{5/2} dx$

7. $\int_0^1 \frac{1}{\sqrt{2x+1}} dx$ 8. $\int_0^2 \frac{x}{\sqrt{x^2+5}} dx$

9. $\int_1^3 (2x - 1)^4 dx$

10. $\int_1^2 (2x + 4)(x^2 + 4x - 8)^3 dx$

11. $\int_{-1}^1 x^2(x^3 + 1)^4 dx$

12. $\int_1^2 \left(x^3 + \frac{3}{4}\right)(x^4 + 3x)^{-2} dx$

13. $\int_1^5 x\sqrt{x-1} dx$ 14. $\int_1^4 x\sqrt{x+1} dx$

Hint: Let $u = x + 1$.

15. $\int_0^2 2xe^{x^2} dx$ 16. $\int_0^1 e^{-x} dx$

17. $\int_0^1 (e^{2x} + x^2 + 1) dx$ 18. $\int_0^2 (e^t - e^{-t}) dt$

19. $\int_{-1}^1 xe^{x^2+1} dx$ 20. $\int_1^4 \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

21. $\int_3^6 \frac{1}{x-2} dx$ 22. $\int_0^1 \frac{x}{1+2x^2} dx$

23. $\int_1^2 \frac{x^2 + 2x}{x^3 + 3x^2 - 1} dx$ 24. $\int_0^1 \frac{e^x}{1+e^x} dx$

25. $\int_1^2 \left(4e^{2u} - \frac{1}{u}\right) du$ 26. $\int_1^2 \left(1 + \frac{1}{x} + e^x\right) dx$

27. $\int_1^2 \left(2e^{-4x} - \frac{1}{x^2}\right) dx$ 28. $\int_1^2 \frac{\ln x}{x} dx$

In Exercises 29–34, find the area of the region under the graph of f on $[a, b]$.

29. $f(x) = x^2 - 2x + 2; [-1, 2]$

30. $f(x) = x^3 + x; [0, 1]$ 31. $f(x) = \frac{1}{x^2}; [1, 2]$

32. $f(x) = 2 + \sqrt{x+1}; [0, 3]$

33. $f(x) = e^{-x^2}; [-1, 2]$ 34. $f(x) = \frac{\ln x}{4x}; [1, 2]$

In Exercises 35–44, find the average value of the function f over the indicated interval $[a, b]$.

35. $f(x) = 2x + 3; [0, 2]$ 36. $f(x) = 8 - x; [1, 4]$

37. $f(x) = 2x^2 - 3; [1, 3]$ 38. $f(x) = 4 - x^2; [-2, 3]$

39. $f(x) = x^2 + 2x - 3; [-1, 2]$

40. $f(x) = x^3; [-1, 1]$ 41. $f(x) = \sqrt{2x+1}; [0, 4]$

42. $f(x) = e^{-x}; [0, 4]$ 43. $f(x) = xe^{x^2}; [0, 2]$

44. $f(x) = \frac{1}{x+1}; [0, 2]$

45. VELOCITY OF A CAR A car moves along a straight road in such a way that its velocity (in feet per second) at any time t (in seconds) is given by

$$v(t) = 3t\sqrt{16 - t^2} \quad (0 \leq t \leq 4)$$

Find the distance traveled by the car in the 4 sec from $t = 0$ to $t = 4$.

46. OIL PRODUCTION On the basis of a preliminary report by a geological survey team, it is estimated that a newly discovered oil field can be expected to produce oil at the rate of

$$R(t) = \frac{600t^2}{t^3 + 32} + 5 \quad (0 \leq t \leq 20)$$

thousand barrels/year, t years after production begins. Find the amount of oil that the field can be expected to yield during the first 5 years of production, assuming that the projection holds true.

47. NET INVESTMENT FLOW The net investment flow (rate of capital formation) of the giant conglomerate LTF incorporated is projected to be

$$t\sqrt{\frac{1}{2}t^2 + 1}$$