16.6 EXERCISES

PRACTICE

In Exercises 1–10, evaluate the given double integral.

1. $\int_0^1 \int_1^2 (x+1)\,dydx$
2. $\int_0^2 \int_1^3 (4-x)\,dydx$
3. $\int_{-1}^2 \int_1^4 (3x+2y)\,dydx$
4. $\int_{-2}^2 \int_3^4 (2x-y)\,dydx$
5. $\int_1^2 \int_2^3 \frac{2y}{x}\,dydx$
6. $\int_1^3 \int_{-1}^2 \frac{3y}{2x}\,dydx$
7. $\int_1^3 \int_{-2}^2 (x^2+3y^2-1)\,dxdy$
8. $\int_2^3 \int_{-1}^1 (2x^2+y^2-x)\,dxdy$
9. $\int_0^2 \int_0^1 e^{x+y}\,dxdy$
10. $\int_0^1 \int_{-1}^2 ye^{xy}\,dxdy$

In Exercises 11–16, evaluate the double integral on the given rectangular region.

11. $\iint_R (x-y^2)\,dA \qquad R: 0 \le x \le 2 \text{ and } 0 \le y \le 1$
12. $\iint_R (xy+x)\,dA \qquad R: 0 \le x \le 3 \text{ and } 0 \le y \le 3$
13. $\iint_R y\sqrt{x+1}\,dA \qquad R: 0 \le x \le 3 \text{ and } 1 \le y \le 5$
14. $\iint_R x^2\sqrt{3+y}\,dA \qquad R: -1 \le x \le 4 \text{ and } 1 \le y \le 6$
15. $\iint_R e^{x+2y}\,dA \qquad R: 0 \le x \le 3 \text{ and } 0 \le y \le 4$
16. $\iint_R e^{2x+y}\,dA \qquad R: 0 \le x \le 2 \text{ and } 0 \le y \le 1$

In Exercises 17–24, evaluate the double integral.

17. $\int_0^2 \int_0^{3x} xy^2\,dydx$
18. $\int_0^1 \int_{2x}^{x^2} x^2y^2\,dydx$
19. $\int_1^4 \int_0^{x^2} \sqrt{\frac{y}{x}}\,dydx$
20. $\int_1^4 \int_x^{x^2} \sqrt{\frac{x}{y}}\,dydx$
21. $\int_1^3 \int_1^{e^y} \frac{y}{x}\,dxdy$
22. $\int_0^2 \int_0^y e^{y^2}\,dxdy$
23. $\int_0^4 \int_0^y \sqrt{9+y^2}\,dxdy$
24. $\int_0^2 \int_0^{4-y^2} y\sqrt{x}\,dxdy$

In Exercises 25–34, evaluate the double integral on the given region.

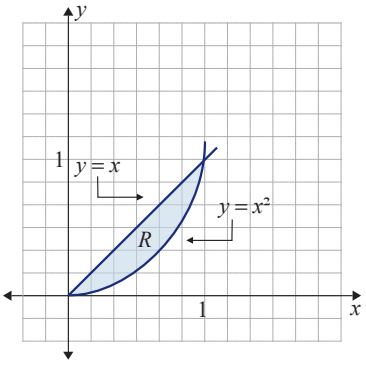
25. $\iint_R 2xy\,dA \qquad R: 0 \le x \le 1 \text{ and } x^2 \le y \le \sqrt{x}$
26. $\iint_R 3xy^2\,dA \qquad R: 0 \le x \le 1 \text{ and } x^3 \le y \le \sqrt[3]{x}$
27. $\iint_R (x^2-y)\,dA \qquad R: 1 \le x \le 2 \text{ and } x \le y \le x^2$

28. $\iint_R (3-2x-2y)\,dA \qquad R: 0 \le x \le 1 \text{ and } 0 \le y \le (2-x)$

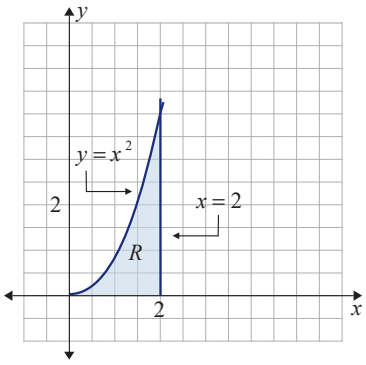
29. $\iint_R e^y\,dA \qquad R: 0 \le x \le 2 \text{ and } x \le y \le 3x$

30. $\iint_R e^y\,dA \qquad R: 0 \le x \le 1 \text{ and } 0 \le y \le 2x$

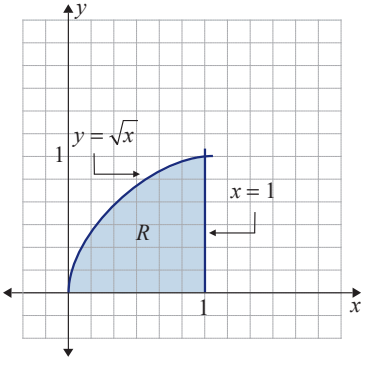
31. $\iint_R (x+y)\,dA$



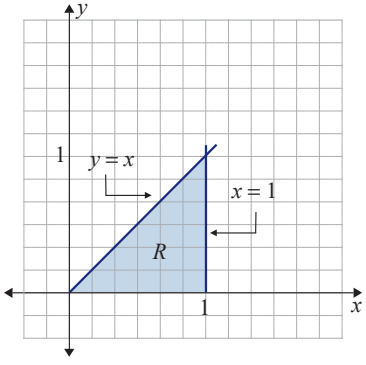
32. $\iint_R (2xy+x)\,dA$



33. $\iint_R (3-2xy)\,dA$



34. $\iint_R \sqrt{4-x^2}\,dA$



35. Find the volume of the solid bounded above by the graph of $f(x,y) = 8 - x^2 - y^2$ and below by the rectangle $R: -1 \le x \le 2$ and $0 \le y \le 2$.

36. Find the volume of the solid bounded above by the graph of $f(x,y) = 2 + x^2 + y^2$ and below by the rectangle R: $0 \le x \le 1$ and $0 \le y \le 3$.

37. Find the volume of the solid bounded above by the graph of $f(x,y) = 8 - 4x - 2y$ and below by the triangle with vertices (0, 0, 0), (2, 0, 0), and (0, 4, 0).

38. Find the volume of the solid bounded above by the graph of $f(x,y) = 3 + x + 2y$ and below by the triangle with vertices (0, 0, 0), (0, 2, 0), and (2, 0, 0).

39. Find the volume of the solid bounded above by the graph of $f(x,y) = 2xy$ and below by the region bounded by $y = \sqrt{x}$, $y = 0$, and $x = 1$.

40. Find the volume of the solid bounded above by the graph of $f(x,y) = 4x^2y$ and below by the region bounded by $y = x^2$, $y = 0$, and $x = 1$.