EXERCISES 14.2

In Exercises 1–4, calculate the given iterated integrals.

1. $\int_0^1 dx \int_0^x (xy + y^2)\, dy$ **2.** $\int_0^1 \int_0^y (xy + y^2)\, dx\, dy$

3. $\int_0^{\pi} \int_{-x}^{x} \cos y\, dy\, dx$ **4.** $\int_0^2 dy \int_0^y y^2 e^{xy}\, dx$

In Exercises 5–14, evaluate the double integrals by iteration.

5. $\iint_R (x^2 + y^2)\, dA$, where R is the rectangle $0 \le x \le a$, $0 \le y \le b$

6. $\iint_R x^2 y^2\, dA$, where R is the rectangle of Exercise 5

7. $\iint_S (\sin x + \cos y)\, dA$, where S is the square $0 \le x \le \pi/2, 0 \le y \le \pi/2$

8. $\iint_T (x - 3y)\, dA$, where T is the triangle with vertices $(0, 0)$, $(a, 0)$, and $(0, b)$

9. $\iint_R xy^2\, dA$, where R is the finite region in the first quadrant bounded by the curves $y = x^2$ and $x = y^2$

10. $\iint_D x \cos y\, dA$, where D is the finite region in the first quadrant bounded by the coordinate axes and the curve $y = 1 - x^2$

11. $\iint_D \ln x\, dA$, where D is the finite region in the first quadrant bounded by the line $2x + 2y = 5$ and the hyperbola $xy = 1$

12. $\iint_T \sqrt{a^2 - y^2}\, dA$, where T is the triangle with vertices $(0, 0)$, $(a, 0)$, and (a, a)

13. $\iint_R \frac{x}{y} e^y\, dA$, where R is the region $0 \le x \le 1, x^2 \le y \le x$

14. $\iint_T \frac{xy}{1 + x^4}\, dA$, where T is the triangle with vertices $(0, 0)$, $(1, 0)$, and $(1, 1)$

In Exercises 15–18, sketch the domain of integration and evaluate the given iterated integrals.

15. $\int_0^1 dy \int_y^1 e^{-x^2}\, dx$ **16.** $\int_0^{\pi/2} dy \int_y^{\pi/2} \frac{\sin x}{x}\, dx$

17. $\int_0^1 dx \int_x^1 \frac{y^{\lambda}}{x^2 + y^2}\, dy \quad (\lambda > 0)$

18. $\int_0^1 dx \int_x^{x^{1/3}} \sqrt{1 - y^4}\, dy$

In Exercises 19–28, find the volumes of the indicated solids.

19. Under $z = 1 - x^2$ and above the region $0 \le x \le 1$, $0 \le y \le x$

20. Under $z = 1 - x^2$ and above the region $0 \le y \le 1$, $0 \le x \le y$

21. Under $z = 1 - x^2 - y^2$ and above the region $x \ge 0$, $y \ge 0$, $x + y \le 1$

22. Under $z = 1 - y^2$ and above $z = x^2$

23. Under the surface $z = 1/(x + y)$ and above the region in the xy-plane bounded by $x = 1$, $x = 2$, $y = 0$, and $y = x$

24. Under the surface $z = x^2 \sin(y^4)$ and above the triangle in the xy-plane with vertices $(0, 0)$, $(0, \pi^{1/4})$, and $(\pi^{1/4}, \pi^{1/4})$

25. Above the xy-plane and under the surface $z = 1 - x^2 - 2y^2$