

MAC2312
Suggested problems on Chapter 6 material
(applications of integration)

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1. Find the area bounded by $y = x$ and $y = x^2 + 1$ between $x = -1$ and $x = 2$.
2. Find the area bounded by $y = \sqrt{x}$ and $y = -\frac{1}{4}x$ between $x = 0$ and $x = 4$.
3. Find the area bounded by $y = x^2$ and $y = 2x$. Find the area by integrating with respect to x , **and** by integrating with respect to y , and check that your two answers are equal.

4. Sketch the region bounded by the curves, and find its area.

$$y = \cos 2x, \quad y = 0, \quad x = \pi/4, \quad x = \pi/2$$

5. Sketch the region bounded by the curves, and find its area.

$$y = e^x, \quad y = e^{2x}, \quad x = 0, \quad x = \ln 2$$

6. Sketch the region bounded by the curves, and find its area.

$$x = 1/y, \quad x = 0, \quad y = 1, \quad y = 3$$

7. Let A denote the region bounded by $y = \sqrt{3-x}$ and the x -axis between $x = -1$ and $x = 3$. Find the volume obtained by revolving A around the x -axis.

8. Let A denote the region bounded by $y = x$ and $y = 2 - x^2$ between $x = 0$ and $x = 1$. Find the volume obtained by revolving A around the x -axis.

9. Find the volume of the solid whose base is the region bounded by $y = x^2$ and the x -axis between $x = 0$ and $x = 2$, and whose cross-sections perpendicular to the x -axis are squares.

10. Find the volume of the solid that results when the region enclosed by $y = \sqrt{25 - x^2}$ and $y = 3$ is revolved around the x -axis.

11. Find the volume of the solid that results when the region enclosed by the given curves is revolved around the y -axis.

$$x = \csc y, \quad y = \pi/4, \quad y = 3\pi/4, \quad x = 0$$

12. Find the volume of the solid that results when the region enclosed by the given curves is revolved around the y -axis.

$$y = \ln x, \quad x = 0, \quad y = 0, \quad y = 1$$

13. Find the volume of the solid that results when the region enclosed by $x = y^2$ and $x = y$ is revolved around the line $y = -1$.

14. Let A denote the region bounded by $y = x^2$ and the x -axis between $x = 1$ and $x = 2$. Find the volume obtained by revolving A around the y -axis.

15. Let A denote the region bounded by $x = 2y - 2y^2$ and the y -axis. Find the volume obtained by revolving A around the x -axis.

16. Find the volume of the solid that results when the region enclosed by the given curves is revolved around the y -axis.

$$y = x^3, \quad x = 1, \quad y = 0$$

17. Find the volume of the solid that results when the region enclosed by the given curves is revolved around the y -axis.

$$y = \frac{1}{x^2 + 1}, \quad x = 0, \quad x = 1, \quad y = 0$$

18. Find the volume of the solid that results when the region enclosed by the given curves is revolved around the x -axis.

$$y^2 = x, \quad y = 1, \quad x = 0$$

19. Find the volume of the solid that is generated when the region enclosed by

$$y = \frac{1}{x^3}, \quad x = 1, \quad x = 2, \quad y = 0$$

is revolved around the line $x = -1$.

20. Find the length of the curve $y = 3x^{3/2} - 1$ between $x = 0$ and $x = 1$.

21. Find the area of the surface generated by revolving the given curve around the x -axis.

$$y = 7x, \quad 0 \leq x \leq 1$$

22. Find the area of the surface generated by revolving the given curve around the x -axis.

$$y = \sqrt{4 - x^2}, \quad -1 \leq x \leq 1$$

23. A cone-shaped water reservoir is 20 ft in diameter across the top and 15 ft deep. If the reservoir is filled to a depth of 10 ft, how much work is required to pump all the water to the top of the reservoir?