1. Compute the area under $y = \sqrt{x} + 1$ from $x = 0$ to $x = 3$.

2. Let $R$ be the region in quadrant 1 bounded by $x = 1$, $x = 2$ and $y = 3x - 1$.
   Find the volume of the solid obtained by rotating the region $R$ about the $x$-axis.

3. Find the area enclosed by $y = x^2$ and $y = x$.

4. Find the area enclosed by $y^2 = x + 6$ and $y = x$.

5. Find the area enclosed by $y = \ln x$ and $y = \frac{(\ln x)^2}{x}$.

6. Find the volume of the solid whose base is the disc centered at the origin with radius one, whose cross sections perpendicular to the $x$-axis are squares.

7. Find the volume of the solid whose base is the region $|x| + |y| \leq 1$ and whose vertical cross sections perpendicular to the $y$ axis are semicircles (with diameter along the base).

8. Find the volume of the solid obtained by rotating about the $y$-axis the region bounded by $y = x^3$, $y = 8$ and $x = 0$.

9. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = \sqrt{x}$ about the $x$-axis.

10. Find the area enclosed by $y = \sin x$, $y = \cos x$, $x = 0$, $x = \pi/4$ about the horizontal line $y = 3$.

11. Find the volume of the solid obtained by rotating the region bounded by $y = 4 - x^2$, $x = 0$, and $x = 1$ about the vertical line $x = 2$.

12. Find the average value of $|x^2 - 2|$ on $[0, 2]$.

13. $\int_0^1 t \pi t \, dt$

14. Find the average value of $y = x^2$ over $[1, 3]$

15. Find the number $c$ for which $\sqrt{c}$ is the average value of $\sqrt{x}$ over the interval $[0, 2]$.

16. Find the average value of $e^x$ on $[0, \ln 2]$

17. $\int_0^1 x^2 e^{-x} \, dx$

18. $16 \int_1^e x^3 \ln x \, dx$

19. $\int_0^{\pi/2} \sin^2 x \cos^3 x \, dx$

20. Let $R$ be region above $x$-axis and below $y = (\sin x)/x$, $0 \leq x \leq \pi/2$. Rotate $R$ about $y$ axis and find volume.

21. Suppose $f(x) = x^2$ and that $f(7)$ is equal to the average value of $f$ on the interval $[2, b]$. What is $b$?

22. $\int_0^{\pi/2} t \cos t \, dt$

23. $\int_0^{\pi/4} \sqrt{\sec^2 x - 1} \, dx$

24. $\int \arcsin x \, dx$
   
   Note: $\frac{d}{dx} \arcsin x = \frac{1}{\sqrt{1 - x^2}}$

25. Let $R$ be the region in the first quadrant enclosed by $y = x^2 + 2$, $y = 6$ and $x = 0$. Rotate $R$ about the $x$ axis. Using shell method, find the integral representing the volume.

26. Suppose we know $f(1) = 0$, $f(2) = 1$, $\int_1^2 f(x) \, dx = -2$. Use integration by parts to find $\int_1^2 x f'(x) \, dx$

27. $\int_0^{\pi/4} \tan^3 x \, dx$

28. Find $\int_0^{\pi/4} \tan^2 x \sec^4 x \, dx$

29. Find $\int_0^\pi \sin^2 x \, dx$

30. Find $\int_0^\pi \cos^2 x \, dx$
31. Find \( \int_{0}^{\pi} \sin^4 x \cos^2 x \, dx \)

32. Find \( \int_{0}^{\pi/3} \sec^2 \theta \, d\theta \)

33. Let \( f(x) = x^2 + 1 \). Find the point \( c \) in \([1, 7]\) such that \( f(c) \) is the average value of \( f \) on \([1, 7]\).

34. Find \( \int_{1}^{2} \log_2(x) \, dx \)

35. Find \( \int_{0}^{\pi/2} x \sin x \, dx \)

36. Find \( \int \sin^3 x \, dx \)