1. Suppose you know that \( \int_2^b f(x) \, dx = \ln(b + 1) \) for \( b > 0 \). What is \( \int_3^5 (3f(x) - 2) \, dx \)?

2. Find a function \( F(x) \) such that \( F''(x) = 4 + 6x + 24x^2 \), \( F(0) = 3 \), \( F(1) = 10 \).

3. Assume \( \int_2^b f(x) \, dx = 2^b + b^2 \) for all numbers \( b > 0 \). Compute \( \int_3^4 f(x) \, dx \).

4. Find \( \int_{-2}^2 |x - 1| \, dx \)

5. Calculate \( \int_1^2 \frac{e^x}{1 - e^x} \, dx \)

6. Let \( u = 2t - 1 \) and rewrite the integral in the variable \( u \).

\[
\int_2^3 t\sqrt{2t-1} \, dt
\]

7. Find \( \int \frac{dx}{x \ln x} \)

8. Compute \( \int \frac{x}{x^2 - 3} \, dx \)

9. Compute \( \int_0^{\pi/3} \sin x \cos^4 x \, dx \)

10. Compute \( \int_0^{\sqrt{\ln 3}} 3x e^{-x^2} \, dx \)

11. Compute \( \int_0^1 \sqrt{x^2 - x^4} \, dx \)

12. Evaluate the definite integral \( \int_0^2 \frac{dx}{\sqrt{2x + 5}} \)

13. Find \( \int \cot(x) \ln(\sin x) \, dx \)

14. \( \int_0^5 \frac{1}{3} x^3 \, dx = \lim_{n \to \infty} R_n \), where \( R_n \) is the right hand Riemann sum. Find \( R_n \).

15. \( \int_1^2 2x^2 + 1 \, dx = \lim_{n \to \infty} R_n \), where \( R_n \) is the right hand Riemann sum. Find \( R_n \).

16. Let \( g(x) = x^3 \). Find the Riemann sum \( L_4 \) for \( g(x) \) on the interval \([1, 3]\)?

17. Evaluate the following limit by first recognizing it as a Riemann sum for a function defined on \([0, 1]\)

\[
\lim_{n \to \infty} \frac{1}{n} \left( \sqrt{\frac{1}{n}} + \sqrt{\frac{2}{n}} + \cdots + \sqrt{\frac{n}{n}} \right)
\]

18. Let \( g(x) = \int_x^2 \tan t \, dt \). Find \( g'(x) \).
19. Let $F(x) = \int_{\tan x}^{\sec x} \sqrt{t^2 + 3} \, dx$. Evaluate $F'(0)$.

20. If $f(x) = \int_0^x (4 - t^2)e^{t^3} \, dt$, on what interval(s) is $f$ decreasing?

21. Find all values of $x$ where $F(x) = \int_0^x t^3 - 3t^2 + 2t \, e^t \, dt$ has a local maximum or local minimum.

22. Which of the following are an antiderivative of $f(x) = 2x^3 + 2x\sin(x^2)$.
   
   (a) $G(x) = \int_0^{x^2} (t + \sin t) \, dt$
   
   (b) $\frac{1}{2}x^4 + \cos(x^2)$

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

24. Let $R$ be the region 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.

25. T/F. If $f(x)$ is continuous and has a minimum of 3 on $[2, 4]$ then we can conclude $\int_2^4 f(x) \, dx \geq 6$.

26. T/F. Given $\int_1^4 g(t) \, dt = -5$ and $\int_4^3 g(t) \, dt = 2$ then $\int_3^1 g(t) \, dt = -7$.

27. Find $\int_{\pi/3}^{\pi/2} \sin t \, dt$ for any $b$.

28. Find $\int_0^{\pi/2} e^\sin x \cos x \, dx$

29. Find $\int_1^2 x\sqrt{x - 1} \, dx$

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

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

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

33. 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.

34. 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).

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

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

37. Find the volume of the solid obtained by rotating the region bounded by $y = \sin x$, $y = \cos x$, $x = 0$, $x = \pi/4$ about the horizontal line $y = 3$.

38. 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 $x = 2$. 