1. Suppose \( \int_1^3 f(x) \, dx = 6 \) and \( \int_1^3 g(x) \, dx = 2 \). What is \( \int_1^3 (2f(x) - 3g(x)) \, dx \)?

2. Suppose \( \int_1^4 f(x) = 8 \), \( \int_1^2 f(x) = 4 \), \( \int_4^f (x) = 2 \), what is \( \int_2^3 f(x) \)?

3. Find \( \int_0^1 x (\sqrt{x} + \sqrt[3]{x}) \, dx \)

4. If \( g(x) = \int_1^x \sqrt{t} \sin(t^2) \, dt \), find \( g'(x) \).

5. Let \( g(x) = \int_0^x f(t) \, dt \) where \( f(t) \) is the graph below. Determine which of the statements are true:
   - (a) \( g \) attains an absolute maximum at \( x = 2 \)
   - (b) \( g \) has a local maximum at \( x = 5 \)
   - (c) \( g \) has a local minimum at \( x = 4 \)
   - (d) \( g \) is concave down on \([0, 2]\)

6. Suppose \( f''(x) = -9 \sin 3x \) and \( f'(0) = 0 \) and \( f(0) = 2 \). Find \( f(\pi/4) \).

7. If \( f''(x) = \sin x \), \( f(0) = -3 \), \( f'(0) = 4 \) and \( f''(0) = 1 \). What is \( f(x) \)?

8. The three graphs below are \( f \), \( f' \) and \( f'' \). Identify which is which.

9. Write \( \int_2^{10} x^6 \, dx \) as a limit of Riemann Sums (right handed sums). (Your answer should be in summation notation.)

10. Suppose you know that \( \int_0^b f(x) \, dx = \ln(b + 1) \) for \( b > 0 \). What is \( \int_3^5 (3f(x) - 2) \, dx \)?

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

12. Find \( \int_{-10}^6 |3x - 2| \, dx \)

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

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

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

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

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

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

19. If \( f(x) = \int_0^x (4 - t^3) e^t \, dt \), on what interval(s) is \( f \) decreasing and on what intervals is \( f \) increasing?

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

21. Find an antiderivative of \( e^{x^2} \sin(3x^2 + \ln x) \).

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

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

24. Find \( \int_{\pi/3}^{b} \sin t \, dt \) for any \( b \).

25. If \( f(5) = 10 \) and \( \int_5^{100} f'(x) \, dx = 73 \), what is \( f(100) \)?

26. Find the value of \( t \) where \( f(t) \) has a local maximum:
\[
f(t) = \int_0^t \frac{2x^2 + x - 10}{1 + \sin^2 t} \, dx.
\]

27. Find an antiderivative of \( \frac{1}{\sqrt{x}} + e^{2x} + \sin 3x \).

28. Suppose you know the following about a function \( f(x) \).

<table>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
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<td>3</td>
<td>1</td>
<td>2</td>
<td>2</td>
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<td>-1</td>
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</tbody>
</table>

Find the Riemann Sum for \( \int_2^6 f(x) \, dx \) using 4 subintervals and right endpoints as sample points.

29. If \( x_i^* \) is a sample point from the \( i \)th subinterval of a regular partition of \([1, 3]\) into \( n \) subintervals, and \( \Delta x \) is the length of each subinterval, find: \( \lim_{n \to \infty} \sum_{i=1}^{n} \frac{3}{2} (x_i^*)^2 \Delta x \).

30. Let \( g(x) = \int_0^x f(t) \, dt \) where \( f \) is the function shown. Find \( g(5) \).

31. Let \( h(x) = \int_{1}^{1/x} \sqrt{1 + u^3} \, du \). Find \( h'(1/2) \).

32. Find \( \lim_{h \to 0} \frac{1}{h} \int_{2}^{2+h} t^2 \sin \left( \frac{\pi t}{4} \right) \, dt \).