

1. For each of the following functions find all possible antiderivatives. Write your answer as $F(x)$.

(a) $f(x) = e^{-3x}$

(f) $f(x) = 7/x$

(b) $f(x) = 4x$

(g) $f(x) = 8\sqrt[3]{x}$

(c) $f(x) = x^9$

(h) $f(x) = \frac{7}{e^{2x}}$

(d) $f(x) = 3x^5 + 1$

(i) $f(x) = 2/\sqrt{x} + 2\sqrt{x}$

(e) $f(x) = \sqrt{e^x}$

2. Sketch the graphs for two possible antiderivatives for the function $f(x) = e^x$.
3. Sketch the graphs for two possible antiderivatives for the function $f(x) = 1/x$.
4. Sketch the graphs for two possible antiderivatives for the function $f(x) = 3x^2$.
5. For each of the following functions $f(x)$ find all possible antiderivatives $F(x)$ satisfying the following property:

(a) $f(x) = x^2 + \sqrt{x}$ and $F(1) = 3$

(b) $f(x) = 2x + 1$ and $F(0) = 5$

(c) $f(x) = e^{7x}$ and $F(0) = 10$

6. Compute the following indefinite:

(a)
$$\int 7(x^2/3 + 3x) dx$$

(c)
$$\int \frac{x^3}{3} + \frac{3}{x^3} + \frac{3}{x} dx$$

(b)
$$\int \frac{1}{e^x} dx$$

(d)
$$\int \frac{3x - 2x^3 + 4x^5}{4x^7} dx$$

7. Use Substitution to compute the following indefinite integrals:

(a)
$$\int 2(2x - 1)^7 dx$$

(d)
$$\int x^4/(x^5 + 11) dx$$

(b)
$$\int (x^2 + 2x + 3)^8(x + 1) dx$$

(e)
$$\int e^{-x^2} 2x dx$$

(c)
$$\int \frac{\sqrt{\ln(x)}}{x} dx$$

(f)
$$\int \frac{3x^2 + 1}{\sqrt[5]{x^3 + x + 10}} dx$$

8. Compute the following definite integrals.

(a)

$$\int_{-2}^2 x^5 + x^3 + x dx$$

(b)

$$\int_{-2}^2 x^2 + 1 dx$$

9. The velocity at time t of a ball thrown up into the air is $v(t) = -32t + 74$ feet per second.

(a) Compute the displacement of the ball over the time interval $0 \leq t \leq 3$.

(b) Given that the initial height of the ball is 6 feet determine its position at $t = 3$.

10. A sample of radioactive material has decay constant .1, and is decaying at a *rate* of $R(t) = -e^{-.1t}$ grams per year. How many grams of the material decayed after the first 10 years? (*Hint*: Let $M(t)$ be the mass of the material after t years. We want to compute the difference $M(10) - M(0)$.)

11. Consider the function $f(x) = 1 - x^2$ on the interval $[-1, 1]$.

(a) Compute the Riemann Sum for $f(x)$ using $n = 3$ rectangles and right endpoints. You may leave your answer as a summation. (*Hint*: Draw a picture!)

(b) Compute the Riemann Sum for $f(x)$ using $n = 3$ rectangles and left endpoints. You may leave your answer as a summation. (*Hint*: Draw a picture!)

12. Consider the function $f(x) = x^3$. Suppose that you wanted to compute the Riemann sum of $f(x)$ on the interval $[0, 3]$ with $n = 10$ rectangles.

(a) What is the area of the leftmost rectangle in the sum, if you used right endpoints?

(b) What is the area of the leftmost rectangle in the sum, if you used left endpoints?

13. For each of the following functions $f(x)$, find the area bounded between the graph of $f(x)$ and the x -axis.

(a) $f(x) = x(x^2 - 1)$ on the interval $[-1, 1]$.

(b) $f(x) = x^2 - 2x - 3$ on the interval from $[-2, 4]$

(c) $f(x) = x^2 - 4$ on the interval from $[-3, 3]$