Exercise 1: A car is moving at a rate of $f(t) = t^2 + 2t$ meters per second for $0 \le t \le 6$ where t is given in seconds. Use a left and right Riemann sum with $n = 3$ subintervals do estimate $\int_0^6 f(t)dt$. Which is the overestimate and which is the underestimate? What are the units of $\int_0^6 f(t)dt$ and what does it represent?

Exercise 2: Let $f(t)$ be a continuous function on the interval $[a, b]$. In your own words, explain what $\int_a^b f(t)dt$ represents and how we *estimate* it.

Exercise 3: The rate of change of a quantity is given by $g(t) = 1 - t^2$ for $0 \le t \le 8$. Find an overestimate for $\int_0^8 g(t)dt$ using a Riemann sum with $n = 4$ subintervals.
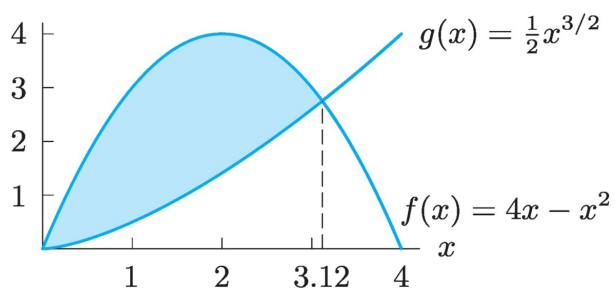

Exercise 4: Consider the graph below. Represent the area between the curve and the x-axis as a definite integral.
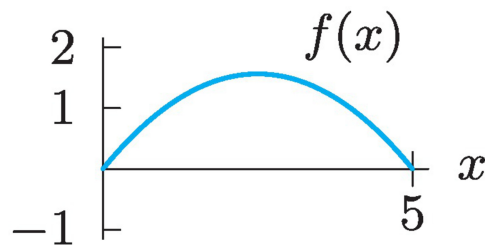
Exercise 5: Consider the graph below. Represent the indicated area as a definite integral.
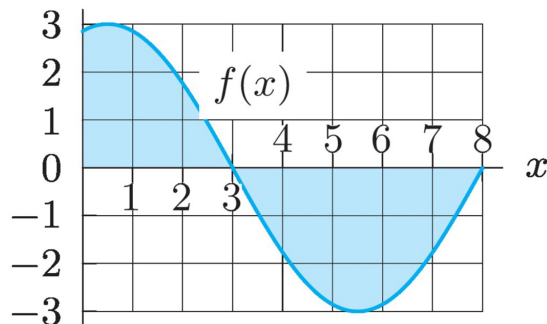
Exercise 6: Consider the graph below. Represent the indicated area as a definite integral.
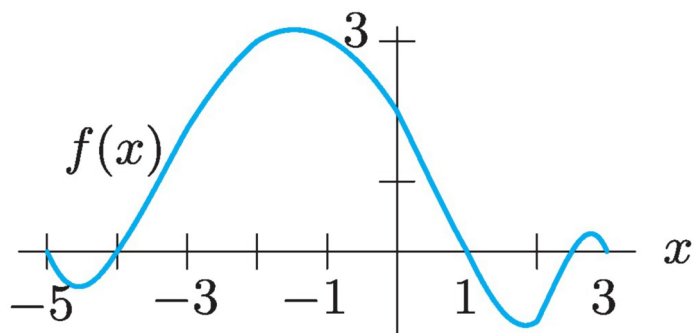

Exercise 7: Use the graph of the function $g(x) = 4x - 8$ to evaluate $\int_2^6 g(x)dx$.

Exercise 8: Consider the graph of $f(x)$ given below. Determine if each of the following is positive, negative or approximately zero.

(a) $\displaystyle\int_{-5}^{1} f(x)dx$
(b) $\displaystyle\int_{1}^{3} f(x)dx$
(c) $\displaystyle\int_{0}^{2.5} f(x)dx$

Exercise 9: Find the indefinite integral: $\int (5x + 7)dx$.

Exercise 10: Find the indefinite integral: $\int (t^2 + 5t + 1)dt$.

Exercise 11: Find the indefinite integral: $\int (\frac{3}{x} - \frac{2}{x^2})dx$.

Exercise 12: Find the indefinite integral: $\int (3\sqrt{w})dw$.

Exercise 13: Find the indefinite integral: $\int (e^x + \frac{1}{\sqrt{x}})dx$.

Exercise 14: Find the indefinite integral: $\int (100e^{4t})dt$.

Exercise 15: Find the indefinite integral: $\int (2\pi r)dr$.

Exercise 16: Find the indefinite integral: $\int (6x - 7^x)dx$.

Exercise 17: Find the derivative of $f(x) = e^{x^2}$.

Exercise 18: Use the previous problem to evaluate $\int_0^6 (2xe^{x^2})dx$.

Exercise 19: Find the derivative of $g(t) = t^2 \ln(t)$.

Exercise 20: Use the previous problem to evaluate $\int_1^4 (2t \ln(t) + t)dt$.

Exercise 21: Find the value of b so that: $\int_0^b x^2 dx = 243$.

Although the following problems *can* be solved in your calculator, you should try to work them by hand first and use your calculator to check.

Exercise 22: Evaluate $\int_0^3 t^3 dt$.

Exercise 23: Evaluate $\int_4^9 \sqrt{x}dx$.

Exercise 24: Evaluate $\int_0^2 (3t^2 + 4t + 3)dt$.

Exercise 25: Evaluate $\int_0^1 2e^x dx$.

Exercise 26: Evaluate $\int_2^7 (\frac{1}{t} - \frac{2}{t^3})dt$.

Exercise 27: Evaluate $\int_0^1 (y^2 + y^4)dy$.