(1) Compute R_6, L_6 and M_6 for $f(x) = -2x^2 - 3x + 1$ on the interval $[2, 8]$.

(2) What is $\int_3^5 dx$? Here the function is $f(x) = 1$.

(3) Let $I = \int_2^7 f(x)\,dx$, where $f(x)$ is continuous. State whether true or false:

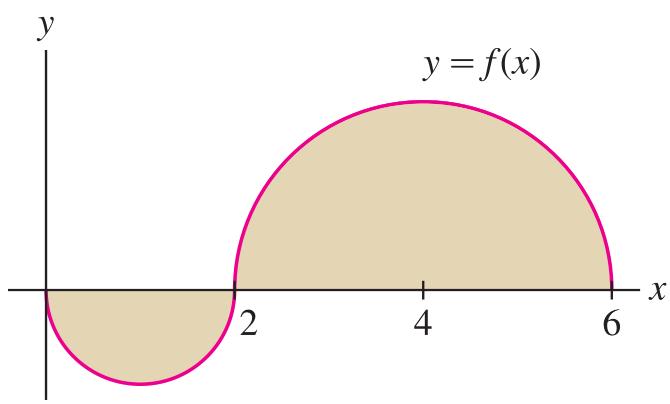
(a) I is the area between the graph and the x-axis over $[2, 7]$.
(b) If $f(x) \geq 0$, then I is the area between the graph and the x-axis over $[2, 7]$.
(c) If $f(x) \leq 0$, then $-I$ is the area between the graph and the x-axis over $[2, 7]$.

(4) Evaluate $\int_0^{2\pi} \sin^2 x\,dx + \int_0^{2\pi} \cos^2 x\,dx$.

(5) Explain graphically $\int_0^{\pi} \cos x\,dx = 0$.

(6) In (a), (b), (c) and (d), refer to the following figure. The two parts of the graph are semicircles.

(a) $\int_0^2 f(x)\,dx$
(b) $\int_0^6 f(x)\,dx$
(c) $\int_1^4 f(x)\,dx$
(d) $\int_1^6 |f(x)|\,dx$



(7) Draw a graph of the signed area represented by the integral and compute it using geometry.

(a) $\int_{-2}^3 |x|\,dx$
(b) $\int_0^5 \sqrt{25 - x^2}\,dx$
(c) $\int_6^8 (7 - x)\,dx$
(d) $\int_{\pi/2}^{3\pi/2} \sin x\,dx$

(8) State whether true or false. If false, sketch the graph of a counterexample.

(a) If $f(x) > 0$, then $\int_a^b f(x)\ dx\ >\ 0$
(b) If $\int_a^b f(x)\ dx\ >\ 0$, then $f(x) > 0$.

(9) Determine the sign of the integral without calculating it. Draw a graph if necessary.

(a) $\int_{-2}^{1} x^4 \, dx$

(b) $\int_{-2}^{1} x^3 \, dx$

(c) $\int_{0}^{2\pi} x \sin x \, dx$

(d) $\int_{0}^{2\pi} \frac{\sin x}{x} \, dx$

(10) Explain the difference in graphical interpretation between

$$\int_a^b f(x) \, dx \quad \text{and} \quad \int_a^b |f(x)| \, dx$$

(11) Let $f(x) = x$. Find an interval $[a, b]$ such that

$$\left| \int_a^b f(x) \, dx \right| = \frac{1}{2} \quad \text{and} \quad \int_a^b |f(x)| \, dx = \frac{3}{2}$$

(12) Use the Comparison Theorem to show that

$$\int_0^1 x^5 \, dx \leq \int_0^1 x^4 \, dx \quad \text{and} \quad \int_1^2 x^4 \, dx \leq \int_1^2 x^5 \, dx$$

(13) Prove that $\frac{1}{3} \leq \int_4^6 \frac{1}{x} \, dx \leq \frac{1}{2}$

(14) Prove that $0 \leq \int_{\pi/4}^{\pi/2} \frac{\sin x}{x} \, dx \leq \frac{\sqrt{2}}{2}$

(15) Find upper and lower bounds for $\int_0^1 \frac{dx}{\sqrt{5x^3 + 4}}$

(16) Prove by computing the limit of right-endpoint approximations, i.e. $\lim_{n \to \infty} R_n$:

$$\int_0^b x^3 \, dx = \frac{b^4}{4}$$

(17) Use the formula derived in the previous problem to calculate the integral $\int_{-1}^{1} |x^3| \, dx$.