

Chapter 2

Definite Integration

2.1 The Definite Integral

Exercises

1. Find the given definite integrals.

(a) $\int_0^1 (x^4 + 3x^3 + 1) dx;$

(b) $\int_{-1}^0 (-2x^5 + 3x^3 - 3x + 1) dx;$

(c) $\int_2^5 (1 + t^2 + 2t^3 - 3x + 1) dt;$

(d) $\int_1^9 \left(\sqrt{t} - \frac{4}{\sqrt{t}} \right) dt;$

(e) $\int_1^3 \left(\frac{1}{x^2} + \frac{1}{x} + 1 \right) dx;$

(f) $\int_0^{\ln 2} (e^t - e^{-t}) dt;$

(g) $\int_{-3}^{-1} \frac{t+1}{t^3} dt;$

(h) $\int_0^4 \frac{1}{\sqrt{6t+1}} dt;$

(i) $\int_1^2 \frac{5t}{(t^3+1)^2} dt;$

- (j) $\int_0^1 (x^3 + 1)\sqrt{x^4 + 2x^2 + 1} \, dx;$
- (k) $\int_1^{e^2} \frac{\ln x^2}{x} \, dx;$
- (l) $\int_1^{e^2} \frac{(\ln x)^2}{x} \, dx;$
- (m) $\int_e^{e^2} \frac{1}{x \ln x} \, dx.$

2. Sketch the region R and then use calculus to find the area of R .

- (a) R is the triangle bounded by the line $y = 4 - 3x$ and the coordinate axes.
- (b) R is the triangle with vertices $(-4, 0)$, $(2, 0)$ and $(2, 6)$.
- (c) R is the rectangle with vertices $(1, 0)$, $(-2, 0)$, $(-2, 5)$ dhe $(1, 5)$.
- (d) R is the trapezoid bounded by the lines $y = x + 6$ and $x = 2$ and the coordinate axes.
- (e) R is the region bounded by the curve $y = \sqrt{x}$, the lines $x = 4$ and $x = 9$, and the x axis.
- (f) R is the region bounded by the curve $y = -x^2 + 4x - 3$ and the x axis.
- (g) R is the region bounded by the curve $y = e^x$, the lines $x = 0$ and $x = \ln \frac{1}{2}$, and the x axis.
- (h) R is the region bounded by the curve $y = x^2 - 2x$ and the x axis.
- (i) R is the region bounded by the curve $y = \frac{1}{x^2}$ and the lines $y = x$ and $y = \frac{x}{8}$.
- (j) R is the region bounded by the curves $y = x^2 - 2x$ dhe $y = -x^2 + 4$.
- (k) R is the region between the curve $y = x^3$ and the line $y = 9x$.
- (l) R is the region between the curves $y = x^3 - 3x^2$ and $y = x^2 + 5x$.