

Section 5.1: Areas and Distances

These notes reflect material from our text, *Calculus, Concepts and Contexts, Second Edition*, by James Stewart, published by Brooks/Cole, Pacific Grove, CA, 2001.

Key points from Stewart, Section 5.1: Area problem, distance problem, Riemann sums.

Concepts

The **area problem**, finding the area of a region R that lies under the graph of $y = f(x)$ between the points a and b . The ancient *method of exhaustion* and its modern systematization *Riemann sums*.

Notation for expressing Riemann sums,

$$\text{area}(R) \approx \sum_{i=1}^n f(x_i^*) \Delta x.$$

Improving the accuracy of a Riemann sum approximation by using more rectangles. Visualizing the errors incurred in Riemann sum approximations for a monotone continuous function f .

Lefthand and righthand endpoints, midpoints, and other choices for x_i^* .

The **distance problem**, finding the distance traveled if the velocity function $v(t)$ is known.

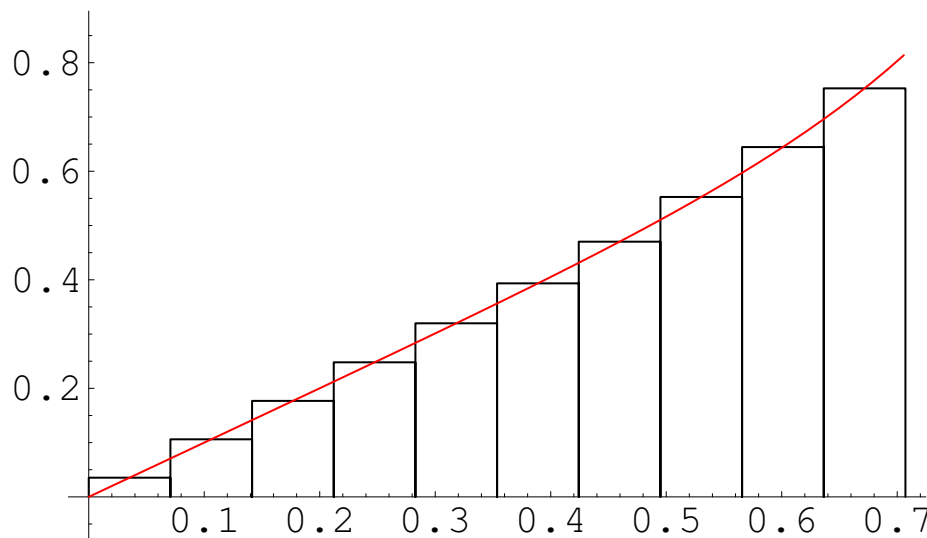


Fig. Riemann sum using the midpoint rule.

Exercises

Exercises for Section 5.1, pp 355–357: 1, 2, 3, 7, 11, 12, 13, 15, 17, 18