5.0   Applications of Definite Integrals

The last chapter introduced the idea of a definite integral as an "area" and a limit of Riemann sums, showed some of the properties of integrals, showed some ways to calculate values of definite integrals, and started to examine a few of their uses. This chapter focuses on several common applications of definite integrals. An obvious goal of the chapter is to enable you to use integration when you encounter these particular applications later in mathematics or in other fields. A deeper goal is to illustrate the process of going from a problem to an integral, a process much broader than these particular applications. If you understand the process, then you can understand the use of integrals in many other fields and can even develop the integrals needed to solve problems in new areas. A final goal is to give you additional practice evaluating definite integrals.

Each section in this chapter follows the same basic format. First a problem is described and some background information presented. Then the solution to the basic problem is approximated using a Riemann sum. An exact answer comes from taking a limit of the Riemann sum, and we get a definite integral. After looking at several examples of the same basic application, we will examine some variations of it.