

CHAPTER 7

THE DEFINITE INTEGRAL

In the previous chapter, the *indefinite integral* $\int f(x) dx$ was studied. This integral gives all the antiderivatives of the function f .

In this chapter, another type of integral is studied, called the *definite integral of f on $[a, b]$* , and denoted by $\int_a^b f(x) dx$. Under suitable conditions, $\int_a^b f(x) dx$ gives information about the area trapped between the graph of f and the x -axis over the interval $[a, b]$.

The integrals $\int f(x) dx$ and $\int_a^b f(x) dx$ are, in one sense, very different: $\int f(x) dx$ is a class of *functions*, (all the antiderivatives of f), but $\int_a^b f(x) dx$ is a *number*. However, in another sense, the integrals are very much related: the Fundamental Theorem of Integral Calculus tells us that if we know just one antiderivative of f , then we can compute the number $\int_a^b f(x) dx$.