TWO DEFINITIONS:

1. The definition of the DEFINITE INTEGRAL (page 230): For a continuous function \( f(x) \) on the interval \( a \leq x \leq b \), the definite integral of \( f \) from \( a \) to \( b \), which we denote by the notation \( \int_{a}^{b} f(x) \, dx \), is the limit of the left-hand or right-hand Riemann Sums with \( n \) subdivisions of \([a, b]\) as \( n \) gets arbitrarily large.

   In other words,
   \[
   \int_{a}^{b} f(x) \, dx = \lim_{n \to \infty} \left( \text{left-hand sum} \right) = \lim_{n \to \infty} \sum_{i=0}^{n-1} f(x_i) \Delta x
   \]
   OR
   \[
   \int_{a}^{b} f(x) \, dx = \lim_{n \to \infty} \left( \text{right-hand sum} \right) = \lim_{n \to \infty} \sum_{i=1}^{n} f(x_i) \Delta x
   \]
   where \( x_i = a + i(\Delta x) \) and \( \Delta x = (b - a)/n \).

2. The definition of the INDEFINITE INTEGRAL (page 268): The indefinite integral of a function \( f(x) \) is defined to be the family of functions whose derivative equals \( f(x) \). To denote the family of all antiderivatives of \( f(x) \), we use the notation
   \[
   \int f(x) \, dx.
   \]
   Thus, if \( F(x) \) is any function such that \( F'(x) = f(x) \) then the family of functions is \( \int f(x) \, dx = F(x) + C \) where \( C \) is allowed to be any constant.
THE FUNDAMENTAL THEOREM (PART 1: page 244): If $f$ is a continuous function on the interval $[a, b]$ and $F'(t) = f(t)$, then

$$\int_a^b f(x) \, dx = F(b) - F(a)$$