Note: The textbook leaves out something important, the indefinite integral also called the anti-derivative.

By the FTC I we have \( \int_a^b g'(x) \, dx = g(b) - g(a) \).

We can write this as \( \int_a^b F'(x) \, dx = F(b) - F(a) \)
where \( F'(x) = f(x) \). The function \( F \) is said to be an anti-derivative of \( f \). For any constant \( C \), \( F(x) + C \) is also an anti-derivative of \( f(x) \).

In fact we know \( \{ F(x) + C \mid C \in \mathbb{R} \} \) is the set of all functions whose derivative is \( f(x) \). This leads us to write

\[ \int f(x) \, dx = F(x) + C \]

where \( F'(x) = f(x) \). It is called the indefinite integral.