One could try to find the integral the long summation way, however it is just simpler and time-reducing to memorize rules similar to the derivative rules.

1. The integral of $f(x) + g(x)$ is equal to the integral of $f(x)$ + the integral of $g(x)$ evaluated from a to b
2. The integral of $c * f(x)$ for some constant c is equal to c * the integral of $f(x)$ evaluated from a to b
3. The integral of dx is $b - a$
4. The integral of x^n is $\frac{x^n + 1}{n + 1}$ evaluated from a to b
5. The integral of x^{-1} is $\ln(x)$
6. The integral of e^u is e^u evaluated from a to b
7. The integral of $\frac{1}{x}$ is $\ln(x)$ evaluated from a to b
8. The integral of $\sin(x)$ is $-\cos(x)$ evaluated from a to b
9. The integral of $\cos(x)$ is $\sin(x)$ evaluated from a to b
10. The integral of $f(x)$ from a to b is equal to the opposite (-) of the integral of $f(x)$ evaluated from b to a

A function $f(x)$ evaluated from a to b is the same as $f(b) - f(a)$. We usually represent it as $f(x)]_a^b$
The integral has some curious properties. However, it only returns a real number and not a function like the derivative because all it does is calculate the area. The properties are eerily familiar though...