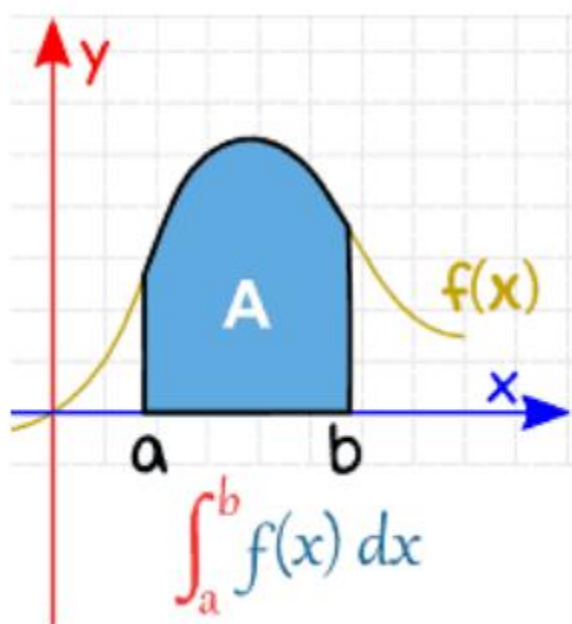


This lesson is on the **definite integral** also called the **Fundamental Theorem of Calculus**.

Definite Integral

A **Definite Integral** has start and end values: in other words there is an **interval** $[a, b]$.


a and b (called limits, bounds or boundaries) are put at the bottom and top of the "S", like this:



Definite Integral
(from **a** to **b**)

Definite Integral

- has limits or boundaries



The diagram shows a definite integral $\int_a^b f(x) dx$. An arrow points from the text "upper limit" to the symbol b above the integral sign. Another arrow points from the text "lower limit" to the symbol a below the integral sign.

$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i^*) \Delta x$$

Definite Integral (The Fundamental Theorem of Calculus)

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

Ex. $\int_1^2 (x^2 + 2x^3) \, dx$

Ex. $\int_1^2 (5x^4 - 6x + 1) dx$

Ex. $\int_{\ln 2}^{\ln 4} e^x \, dx$

Ex.

$$\int_0^{\frac{\pi}{4}} \sec^2 x \, dx$$

** If an answer is undefined and you are not sure why, check upper and lower limits.

** The definite integral $\int_{-2}^4 \frac{1}{x^3} dx$

is undefined because the function is undefined at $x = 0$.

**can not do integral

$$\int_2^6 \frac{1}{x-4} dx$$

→ undefined at $x = 4$

→ cannot do integral

$$\int_5^6 \frac{1}{x-4} dx$$

→ undefined at $x = 4$, but you can do the integral

$x = 4$ is not contained in the boundaries