

The definite integral is defined by

$$\int_a^b f(x)dx = \lim_{\max \Delta x_i \rightarrow 0} f(x_i^*)\Delta x_i,$$

where the points $a = x_0 < x_1 < \cdots < x_n = b$ partition $[a, b]$, $\Delta x_i = x_i - x_{i-1}$, and $x_i^* \in [x_{i-1}, x_i]$.

The following are proposed properties of the definite integral. For each one:

- if it is true, mark it TRUE;
- if it is almost true, correct it to make it true; or
- if it terribly wrong, mark it FALSE!

1. $\int_a^b f(x)dx = \int_a^b f(y)dy$

2. $\int_a^a f(x)dx = 0$

3. $\int_a^b f(x)dx = \int_0^{b-a} f(x-a)dx$

4. $\int_a^b f(x)dx = \int_b^a f(x)dx$

5. $\int_a^b f(x)dx + \int_c^d f(x)dx = \int_{a+c}^{b+d} f(x)dx$

6. $\int_a^b f(x)dx + \int_b^d f(x)dx = \int_a^d f(x)dx$

7. $\int_a^b 5f(x)dx = 5 \int_a^b f(x)dx$

$$8. \int_a^b (f(x)g(x)) dx = \left(\int_a^b f(x)dx \right) \left(\int_a^b g(x)dx \right)$$

$$9. \int_a^b (f(x) + g(x)) dx = \left(\int_a^b f(x)dx \right) + \left(\int_a^b g(x)dx \right)$$

$$10. f(x) \geq 0 \Rightarrow \int_a^b f(x)dx \geq 0$$

$$11. f(x) \geq g(x) \Rightarrow \int_a^b f(x)dx \geq \int_a^b g(x)dx$$

$$12. \{m \leq f(x) \leq M \text{ and } a < b\} \Rightarrow m(b-a) \leq \int_a^b f(x)dx \leq M(b-a)$$

$$13. \int_a^b |f(x)| dx = \left| \int_a^b f(x)dx \right|$$

$$14. \int_a^b \frac{1}{f(x)} dx = \frac{1}{\int_a^b f(x)dx}$$

$$15. \frac{d}{dx} \int_a^b f(x)dx = f(b) - f(a)$$

$$16. \int_a^b \left(\frac{d}{dx} f(x) \right) dx = f(b) - f(a)$$