

CÁLCULO DIFERENCIAL E INTEGRAL

Integral definida: parte I

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1. Calcular a integral definida

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| 1) $\int_{-3}^5 (3x^3 + 2x^2 + 3x + 8) \, dx$ | 2) $\int_0^{10} (2\sqrt{x} + 3\sqrt[3]{x}) \, dx$ | 3) $\int_{-1}^1 (3\pi + \sqrt{5}) \, dx$ |
| 4) $\int_2^5 (1 + x + e^x - e^{\log 3}) \, dx$ | 5) $\int_1^8 \ln(x + 1) \, dx$ | 6) $\int_{\pi}^{2\pi} \frac{\sin^2 x - 1}{\cos x} \, dx$ |
| 7) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{1}{4} \operatorname{tg} x \, dx$ | 8) $\int_c^d \frac{x^2 + 2x + 4}{x^3} \, dx$ | 9) $\int_3^a (x^6 - x^{-4} + x^3) \, dx$ |
| 10) $\int_0^{\frac{\pi}{4}} \frac{1}{2} \operatorname{tg} x \cos x \, dx$ | 11) $\int_k^3 \frac{x^2 - 2x}{x^3 - 3x^2 + 1} \, dx$ | 12) $\int_{2k+\pi}^r \frac{x - 2}{x^2 - 4} \, dx$ |
| 13) $\int_0^1 \frac{ax^3 + bx^2 + cx + d}{k} \, dx$ | 14) $\int_0^1 \left(\frac{1}{\sqrt{x}} + \frac{2x\sqrt{x}}{10} \right) \, dx$ | 15) $\int_{-1}^2 4x^3 + \sqrt{x+1} \, dx$ |
| 16) $\int_0^{0.9} \frac{16}{1 - x^2} \, dx$ | 17) $\int_{-1}^3 \frac{5}{2x^4 - x^2} \, dx$ | 18) $\int_{-5}^{10} \left(2e^x - \frac{1}{2}e^{-x} \right) \, dx$ |

2. Avalie a integral e a interprete em termos de cálculo de área

- a) $\int_0^3 \left(\frac{1}{2}x - 1 \right) \, dx$ b) $\int_2^{-2} \sqrt{4 - x^2} \, dx$ c) $\int_{-3}^0 \left(1 + \sqrt{9 - x^2} \right) \, dx$
- d) $\int_{-1}^2 |x| \, dx$ e) $\int_{-1}^3 (3 - 2x) \, dx$ f) $\int_0^{10} |x - 5| \, dx$

3. Avalie a integral $\int_{\frac{\pi}{2}}^{\pi} \sin^2 x \cos^4 x \, dx$

4. Dada que a integral $\int_0^1 3x\sqrt{x^2 + 4} \, dx = 5\sqrt{5} - 8$, o que é a integral $\int_1^0 3u\sqrt{u^2 + 4} \, dx$? Justifique.

5. Escreva a integral a seguir na forma de uma integral simples do tipo $\int_a^b f(x) \, dx$:

$$\int_{-5}^{10} f(x) \, dx + \int_{10}^{12} f(x) \, dx - \int_{-7}^{-5} f(x) \, dx$$

6. Se $\int_1^5 f(x) dx = 12$ e $\int_4^5 f(x) dx = 3$, determine $\int_1^4 f(x) dx$.

7. Determine a integral $\int_0^5 f(x) dx$ tal que

$$f(x) = \begin{cases} 3, & \text{para } x < 3 \\ x, & \text{para } x \geq 3 \end{cases}$$

8. Avalie as integrais

1) $\int_{-2}^3 (x^2 - 3) dx$ 2) $\int_1^2 x^{-2} dx$ 3) $\int_0^2 \left(x^4 - \frac{3}{4}x^2 + \frac{2}{3}x - 1 \right) dx$

4) $\int_0^1 \left(1 + \frac{1}{2}u^4 - \frac{2}{5}u^9 \right) du$ 5) $\int_0^1 x^{\frac{4}{5}} dx$ 6) $\int_1^8 \sqrt[3]{x} dx$

7) $\int_{-1}^0 (2x - e^x) dx$ 8) $\int_0^1 x (\sqrt[3]{x} + \sqrt[4]{x}) dx$ 9) $\int_0^2 (y - 1)(2y + 1) dy$

10) $\int_{-1}^1 t(1 - t)^2 dt$ 11) $\int_0^{\frac{\pi}{4}} \sec \theta \operatorname{tg} \theta d\theta$ 12) $\int_0^{\frac{\pi}{4}} \sec^2 x dx$

13) $\int_1^9 \frac{1}{2x} dx$ 14) $\int_1^2 \frac{x^3 + 3x^6}{x^4} dx$ 15) $\int_0^{\frac{\pi}{3}} \frac{\operatorname{sen} x + \operatorname{sen} x \operatorname{tg}^2 x}{\sec^2 x} dx$

16) $\int_0^{\frac{\pi}{4}} \frac{1 + \cos^2 x}{\cos^2 x} dx$ 17) $\int_a^b \frac{4t}{t^2 + 1} dx$ 18) $\int_1^2 \frac{(x - 1)^3}{x^2} dx$

9. Determine a área da região formada pelas curvas

1) $f(x) = x^2 + 4x + 2$, $x = 1$, $y = 0$ 2) $f(x) = \ln(x)$, $x = 4$, $y = 0$

3) $f(x) = e^x$, $x = -1$, $x = 0$, $y = 0$ 4) $f(x) = \frac{1}{x}$, $x = 5$, $x = 1$, $y = 0$

Alguns exercícios foram retirados do livro *Single variable calculus: concepts & contexts* (Stewart, 2010).

Referências

Stewart, J. *Single variable calculus: concepts and contexts*. Brooks/Cole, 4 ed., 630 p., 2010.

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