

Cálculo 2 - Lista 9

O teorema fundamental do cálculo

Encontre a derivada de cada função dada nos exercícios 1-5

1. $F(x) = \int_0^x t(1+t^3)^{29} dt$

2. $F(y) = \int_y^2 \frac{1}{t^3} dt$

3. $F(x) = \int_0^{x^2} t \sin t dt$

4. $G(y) = \int_y^{y^2} \sqrt{(1+t^2)} dt$

5. $F(x) = \frac{d}{dx} \int_0^{4x} (1+t^2)^{4/5} dt$

Use o teorema fundamental para calcular as integrais dadas nos exercícios 6-18

6. $\int_0^1 4 dx$

7. $\int_1^3 -y dy$

8. $\int_1^{-3} 3u du$

9. $\int_0^1 x^{100} dx$

10. $\int_{-1}^1 u^{1/3} du$

11. $\int_1^4 x^{-7/9} dx$

12. $\int_{-3/2}^{2\pi} (5-x) dx$

13. $\int_{-4}^{-1} (5x+14) dx$

14. $\int_{-\pi}^{\pi/3} \cos x dx$

15. $\int_{\pi/3}^{-\pi/4} \sin t dt$

16. $\int_1^2 \frac{1}{y^4} dy$

17. $\int_{\pi/6}^{\pi/2} \csc^2 t dt$

18. $\int_0^{\pi/6} \left(\frac{d}{dx} \sin^5 x \right) dx$

19. Encontre o número I satisfazendo

$$(x_0^2 + 4x_0)\Delta x_1 + \dots + (x_{n-1}^2 + 4x_{n-1})\Delta x_n \leq I \leq (x_1^2 + 4x_1)\Delta x_1 + \dots + (x_n^2 + 4x_n)\Delta x_n$$

para toda partição $\mathcal{P} = \{x_0, x_1, \dots, x_n\}$ de $[1, 2]$.

20. Encontre o número I satisfazendo

$$\begin{aligned} &(\cos x_1 - \sin x_1)\Delta x_1 + \dots + (\cos x_n - \sin x_n)\Delta x_n \leq I \leq \\ &\leq (\cos x_0 - \sin x_0)\Delta x_1 + \dots + (\cos x_{n-1} - \sin x_{n-1})\Delta x_n \end{aligned}$$

para toda partição $\mathcal{P} = \{x_0, x_1, \dots, x_n\}$ de $[0, \pi/2]$.

Respostas

1. $F'(x) = x(1 + x^3)^{29}$
2. $F'(y) = -\frac{1}{y^3}$
3. $F'(x) = 2x^3 \sin x^2$
4. $G'(y) = -\sqrt{1 + y^2} + 2y\sqrt{1 + y^4}$
5. $F'(x) = \frac{512}{5}x(1 + 16x^2)^{-\frac{1}{5}}$
6. 4
7. -4
8. 12
9. $\frac{1}{101}$
10. 0
11. $\frac{9}{2}(4^{2/9} - 1)$
12. $10\pi - 2\pi^2 + \frac{69}{8}$
13. $\frac{9}{2}$
14. $\frac{\sqrt{3}}{2}$
15. $\frac{1}{2} - \frac{\sqrt{2}}{2}$
16. $\frac{7}{24}$
17. $\sqrt{3}$
18. $\frac{1}{32}$
19. $\frac{25}{3}$
20. 0