

LISTA 9 - INTEGRAIS

Exercícios de Regras básicas de antiderivação

Use as regras básicas para calcular as integrais abaixo:

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| 1) $\int (3x^2 - 4x - 5) dx$ | 2) $\int (x^3 - 3x^2 + 2x - 4) dx$ | 17) $\int 4 \operatorname{arctg} x + \frac{2x^5 - \sqrt{x}}{x} dx$ |
| 3) $\int (2x^3 - 4x^2 - 5x + 6) dx$ | 4) $\int (2x^3 - 1)(x^2 + 5) dx$ | 18) $\int \cos x - 5 \operatorname{sen} x dx$ |
| 5) $\int (3x^2 - \sqrt{5x} + 2) dx$ | 6) $\int (4x^2 + 3)^2 dx$ | 19) $\int 3e^x + 7 \operatorname{sec}^2 x dx$ |
| 7) $\int (x^2 + 3x + x^{-2}) dx$ | 8) $\int (3x^{-2} + 5x^{-4}) dx$ | 20) $\int \frac{4}{\sqrt{1-x^2}} dx$ |
| 9) $\int (25x^3 - 1)x^{-1/2} dx$ | 10) $\int x^3 \sqrt{x} dx$ | |
| 11) $\int \frac{x^3 + 2x - 7}{x} dx$ | 12) $\int \sqrt{x} (x^2 - 1) dx$ | |
| 13) $\int \left(3x^2 - \frac{6}{5}x + \frac{4}{x} \right) dx$ | 14) $\int \left(\sqrt[3]{x^2} + \frac{1}{3x} \right) dx$ | |
| 15) $\int \frac{(x^2 - 4)^2}{2x^2} dx$ | 16) $\int \frac{9x^4 - 4x^3 + 5x^2 - 2x - 1}{x^2} dx$ | |

Respostas:

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|---|--|--|
| 1) $x^3 - 2x^2 - 5x + C$ | 2) $\frac{x^4}{4} - x^3 + x^2 - 4x + C$ | 19) $3e^x + 7 \operatorname{tg} x + C$ |
| 3) $\frac{x^4}{2} - \frac{4x^3}{3} - \frac{5x^2}{2} + 6x + C$ | 4) $\frac{x^6}{3} + \frac{5x^4}{2} - \frac{x^3}{3} - 5x + C$ | 20) $4 \operatorname{arcsen} x + C$ |
| 5) $x^3 - \frac{2\sqrt{5}}{3} x^{3/2} + 2x + C$ | 6) $\frac{16x^5}{5} + 8x^3 + 9x + C$ | |
| 7) $\frac{x^3}{3} + \frac{3x^2}{2} - x^{-1} + C$ | 8) $-3x^{-1} - \frac{5}{3} x^{-3} + C$ | |
| 9) $\frac{50}{7} x^{7/2} - 2x^{1/2} + C$ | 10) $\frac{2}{9} x^{9/2} + C$ | |
| 11) $\frac{1}{3} x^3 + 2x - 7 \ln x + C$ | 12) $\frac{2}{7} x^{7/2} - \frac{2}{3} x^{3/2} + C$ | |
| 13) $x^3 - \frac{3}{5} x^2 + 4 \ln x + C$ | 14) $\frac{3}{5} x^{5/3} + \frac{1}{3} \ln x + C$ | |
| 15) $\frac{1}{6} x^3 - 4x - 8x^{-1} + C$ | 16) $3x^3 - 2x^2 + 5x - 2 \ln x + x^{-1} + C$ | |
| 17) $-4 \cos x + \frac{2}{5} x^5 - 2\sqrt{x} + C$ | 18) $\operatorname{sen} x + 5 \cos x + C$ | |

Exercícios - Integração por substituição - Parte I

Calcule as integrais:

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| 1) $\int (4x + 3)^4 dx$ | 2) $\int x(4x^2 + 7)^9 dx$ | 17) $\int \cos 3x dx$ |
| 3) $\int 4x \sqrt{x^2 + 5} dx$ | 4) $\int 3x(4 - 3x^2)^{-8} dx$ | 18) $\int \frac{\operatorname{sen} \sqrt{x}}{\sqrt{x}} dx$ |
| 5) $\int \frac{x}{\sqrt[3]{5x^2 + 16}} dx$ | 6) $\int \frac{8x + 2}{(4x^2 + 2x + 6)^{17}} dx$ | 19) $\int e^{\operatorname{sen} \theta} \cos \theta d\theta$ |
| 7) $\int \frac{6x^2}{(x^3 + 1)^3} dx$ | 8) $\int \frac{x - 3}{(1 - 6x + x^2)^2} dx$ | 20) $\int \frac{\operatorname{arctg} x}{1 + x^2} dx$ |
| 9) $\int (2x^2 - 1)(6x^3 - 9x + 1)^{-3/2} dx$ | 10) $\int x(5 - x)^{1/2} dx$ | |
| 11) $\int x(x + 1)^{-1/2} dx$ | 12) $\int x^2 \sqrt{1 + x} dx$ | |
| 13) $\int (x + 2)(2 - x)^{-1/3} dx$ | 14) $\int (x + 2)^2(1 + x)^{1/2} dx$ | |
| 15) $\int \frac{3x - 3}{(x^2 - 2x + 6)^2} dx$ | 16) $\int \frac{x^2 + 1}{\sqrt{x^3 + 3x}} dx$ | |

Respostas:

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|--|---|--|
| 1) $\frac{(4x + 3)^5}{20} + C$ | 2) $\frac{(4x^2 + 7)^{10}}{80} + C$ | |
| 3) $\frac{4}{3} \sqrt{(x^2 + 5)^3} + C$ | 4) $\frac{1}{14(4 - 3x^2)^7} + C$ | |
| 5) $\frac{3}{20} (5x^2 + 16)^{2/3} + C$ | 6) $\frac{-1}{16} (4x^2 + 2x + 6)^{-16} + C$ | |
| 7) $-(x^3 + 1)^{-2} + C$ | 8) $-(2 - 12x + 2x^2)^{-1} + C$ ou $\frac{-(1 - 6x + x^2)^{-1}}{2}$ | |
| 9) $-\frac{2}{9} (6x^3 - 9x + 1)^{-1/2} + C$ | 10) $-\frac{10}{3} (5 - x)^{3/2} + \frac{2}{5} (5 - x)^{5/2} + C$ | |
| 11) $\frac{2}{3} (x + 1)^{3/2} - 2(x + 1)^{1/2} + C$ | 12) $\frac{2}{7} (1 + x)^{7/2} - \frac{4}{5} (1 + x)^{5/2} + \frac{2}{3} (1 + x)^{3/2} + C$ | |
| 13) $-6(2 - x)^{2/3} + \frac{3}{5} (2 - x)^{5/3} + C$ | 14) $\frac{2}{7} (1 + x)^{7/2} + \frac{4}{5} (1 + x)^{5/2} + \frac{2}{3} (1 + x)^{3/2} + C$ | |
| 15) $-\frac{3}{2} \left(\frac{1}{x^2 - 2x + 6} \right) + C$ | 16) $\frac{2}{3} (x^3 + 3x)^{1/2} + C$ | 17) $\frac{1}{3} \operatorname{sen} 3x + C$ |
| 18) $2 \cos \sqrt{x} + C$ | 19) $e^{\operatorname{sen} \theta} + C$ | 20) $\frac{(\operatorname{arctg} x)^2}{2} + C$ |

Exercícios - Integração por substituição - Parte II

Determine as integrais:

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|--------------------------------|---|--|
| 1) $\int xe^{x^2} dx$ | 2) $\int e^{1-x} dx$ | 11) $\int \cot x dx$ |
| 3) $\int \frac{\ln 5x}{x} dx$ | 4) $\int \frac{1}{x(\ln x)^2} dx$ | 12) $\int \frac{\cos \sqrt{t}}{\sqrt{t}} dt$ |
| 5) $\int e^{-x} dx$ | 6) $\int 5e^{3x} dx$ | 13) $\int \sec 2\theta \tan 2\theta d\theta$ |
| 7) $\int \frac{\ln x^2}{x} dx$ | 8) $\int \frac{3}{2x+1} dx$ | |
| 9) $\int \frac{1}{x \ln x} dx$ | 10) $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$ | |

Respostas:

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|---------------------------------|---------------------------------|------------------------------------|
| 1) $\frac{1}{2} e^{x^2} + C$ | 2) $-e^{1-x} + C$ | 11) $\ln \sec x + C$ |
| 3) $\frac{1}{2} (\ln 5x)^2 + C$ | 4) $-\frac{1}{\ln x} + C$ | 12) $2 \sin \sqrt{t} + C$ |
| 5) $-e^{-x} + C$ | 6) $\frac{5}{3} e^{3x} + C$ | 13) $\frac{1}{2} \sec 2\theta + C$ |
| 7) $(\ln x)^2 + C$ | 8) $\frac{3}{2} \ln 2x+1 + C$ | |
| 9) $\ln \ln x + C$ | 10) $2e^{\sqrt{x}} + C$ | |

Exercícios - Integração por partes

Use o método de integração por partes para calcular as integrais abaixo:

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|-----------------------------|---|--|
| 1) $\int \ln x dx$ | 6) $\int x^{-2} \ln x dx$ | 11) $\int \theta \sec^2 \theta d\theta$ ($u = \theta, dv = \sec^2 \theta d\theta$) |
| 2) $\int x e^{-2x} dx$ | 7) $\int x e^{x/2} dx$ | 12) $\int x \cos x dx$ |
| 3) $\int x \ln 3x dx$ | 8) $\int x^2 \ln x^2 dx$ | 13) $\int e^x \sin x dx$ |
| 4) $\int x e^x dx$ | 9) $\int 5x e^{3x} dx$ | 14) $\int \sin \sqrt{x} dx$ (Primeiro passo a substituição $u = \sqrt{x}$) |
| 5) $\int \sqrt{x} \ln x dx$ | 10) $\int 3x^2 \ln \left(\frac{x}{2}\right) dx$ | |

Respostas:

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| 1) $x \ln x - x + C$ | 6) $\frac{-\ln x}{x} - \frac{1}{x} + C$ |
| 2) $\frac{-xe^{-2x}}{2} - \frac{e^{-2x}}{4} + C$ | 7) $2x e^{x/2} - 4e^{x/2} + C$ |
| 3) $\frac{x^2}{2} \ln 3x - \frac{x^2}{4} + C$ | 8) $\frac{x^3}{3} \ln x^2 - \frac{2}{9} x^3 + C$ |
| 4) $x e^x - e^x + C$ | 9) $\frac{5}{3} x e^{3x} - \frac{5}{9} e^{3x} + C$ |
| 5) $\frac{2}{3} x^{3/2} \ln x - \frac{4}{9} x^{3/2} + C$ | 10) $x^3 \ln \left(\frac{x}{2}\right) - \frac{x^3}{3} + C$ |
| 11) $\theta \tan \theta - \ln \sec \theta + C$ | 12) $-x \cos x + \sin x + C$ |
| 13) $\frac{1}{2} e^x (\sin x - \cos x) + C$ | 14) $-2\sqrt{x} \cos \sqrt{x} + 2 \sin \sqrt{x} + C$ |