

Engenharia Civil e Engenharia Mecânica

Prof^a. Me. Samanta Santos da Vara Vanini

Exercícios

Resolver as seguintes integrais por partes

a. $\int x \operatorname{sen}(x) dx$

b. $\int \ln(x) dx$

c. $\int x e^x dx$

d. $\int x^2 e^x dx$

e. $\int x \cos(x) dx$

f. $\int x^2 e^{3x} dx$

g. $\int x \operatorname{sen}(5x) dx$

h. $\int x^3 e^{2x} dx$

i. $\int x \cos(3x) dx$

j. $\int x e^{-x} dx$

k. $\int \frac{\ln(x)}{\sqrt{x}} dx$

l. $\int \ln(x) x^{-3} dx$

m. $\int e^x \cdot \cos x dx$

n. $\int e^{2x} \cdot \operatorname{sen}(3x) dx$

Respostas

a. $-x \cos(x) + \operatorname{sen}(x) + C$

b. $x \ln(x) - x + C$

c. $x e^x - e^x + C$

d. $x^2 e^x - 2x e^x + 2e^x + C$

e. $x \operatorname{sen}(x) + \cos(x) + C$

f. $e^{3x} \left(\frac{x^2}{3} - \frac{2x}{9} + \frac{2}{27} \right) + C$

g. $\frac{-x}{5} \cos(5x) + \frac{1}{25} \operatorname{sen}(5x) + C$

h. $e^{2x} \left(\frac{x^3}{2} - \frac{3x^2}{4} + \frac{3x}{4} - \frac{3}{8} \right) + C$

Resolva as seguintes integrais de potências trigonométricas.

1. $\int \operatorname{sen}^3 x dx$

4. $\int \operatorname{sen}^2 x \cdot \cos^3 x dx$

2. $\int \operatorname{sen}^4 x \cdot \cos x dx$

5. $\int \operatorname{sen}^2(3x) \cdot \cos^2(3x) dx$

3. $\int \cos^2 \left(\frac{x}{2} \right) dx$

6. $\int \frac{\cos^3(3x)}{\sqrt[3]{\operatorname{sen}(3x)}} dx$

Respostas

1. $-\cos(x) + \frac{\cos^3(x)}{3} + C$

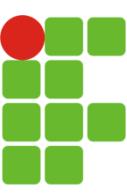
2. $\frac{\operatorname{sen}^5(x)}{5} + C$

3. $\frac{x}{2} + \frac{1}{2} \operatorname{sen}(x) + C$

4. $\frac{\operatorname{sen}^3(x)}{3} - \frac{\operatorname{sen}^5(x)}{5} + C$

5. $\frac{x}{8} - \frac{\operatorname{sen}(12x)}{96} + C$

6. $\frac{1}{2} \sqrt[3]{(\operatorname{sen}(3x))^2} - \frac{1}{8} \sqrt[3]{(\operatorname{sen}(3x))^8} + C$



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Resolva as seguintes integrais por substituição trigonométrica.

a) $\int \frac{dx}{x^2 \sqrt{16 - x^2}}$

b) $\int \frac{\sqrt{9 - x^2}}{x^2} dx$

c) $\int \frac{dt}{t^3 \sqrt{t^2 - 25}}$

d) $\int \sqrt{x^2 + 5} dx$

e) $\int \frac{dx}{x^3 \sqrt{x^2 - 9}}$

f) $\int \frac{\sqrt{x^2 - 9}}{x} dx$

g) $\int \frac{1}{\sqrt{4 + x^2}} dx$

h) $\int \frac{1}{(4x^2 + 9)^2} dx$

i) $\int \frac{x^2}{1 + x^2} dx$

j) $\int \frac{1}{\sqrt{4 - 9x^2}} dx$

Respostas

a) $\frac{-\sqrt{16 - x^2}}{16x} + c$

b) $\frac{-\sqrt{9 - x^2}}{x} - \arcsen\left(\frac{x}{3}\right) + c$

c) $\frac{1}{250} \left(\arcsec \frac{t}{5} + \frac{5\sqrt{t^2 - 25}}{t^2} \right) + c$

d) $\frac{x\sqrt{x^2 + 5}}{2} + \frac{5}{2} \ln \left| \frac{\sqrt{x^2 + 5}}{\sqrt{5}} + \frac{x}{\sqrt{5}} \right| + c$

e) $\frac{1}{54} \arcsec \frac{x}{3} + \frac{\sqrt{x^2 - 9}}{18x^2} + c$

f) $3 \left(\frac{\sqrt{x^2 - 9}}{3} - \arcsec \left(\frac{x}{3} \right) \right) + c$

g) $\ln \left| \frac{\sqrt{4 + x^2}}{2} + \frac{x}{2} \right| + C$

h) $\frac{1}{54} \arctg \left(\frac{2x}{3} \right) + c$

i) $x - \arctg(x) + c$

j) $\frac{1}{3} \arcsen \left(\frac{3x}{2} \right) + c$

Resolva as integrais das seguintes funções racionais – Caso 1 e Caso 2

1) $\int \frac{3x + 13}{(x - 4)(x + 10)} dx$

2) $\int \frac{dx}{x(x + 1)}$

3) $\int \frac{x^2 - 16x - 11}{(x - 3)(x + 2)^2} dx$

4) $\int \frac{1}{x^2 - 4} dx$

5) $\int \frac{x}{(x + 3)^2} dx$

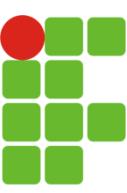
6) $\int \frac{dx}{x^2 + x - 2}$

7) $\int \frac{(x - 1)}{x^3 - x^2 - 2x} dx$

8) $\int \frac{x^3 - 1}{x^2(x - 2)^3} dx$

9) $\int \frac{x^3 + 1}{x(x + 4)} dx$

10) $\int \frac{x^3 - 1}{x^2 - x - 2} dx$



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Respostas

$$1) \frac{25}{14} \ln|x-4| + \frac{17}{14} \ln|x+10| + c$$

$$2) \ln|x| - \ln|x+1| + c$$

$$3) -2 \ln|x-3| + \frac{5}{x+2} + 3 \ln|x+2| + c$$

$$4) \frac{-1}{4} \ln|x+2| + \frac{1}{4} \ln|x-2| + c$$

$$5) \frac{3}{x+3} + \ln|x+3| + c$$

$$6) \frac{1}{3} [\ln|x-1| - \ln|x+2|] + c$$

$$7) \frac{1}{2} \ln|x| + \frac{1}{6} \ln|x-2| - \frac{2}{3} \ln|x+1| + c$$

$$8) \frac{-1}{8x} + \frac{3}{16} \ln(x) - \frac{7}{8(x-2)^2} - \frac{5}{4(x-2)} - \frac{3}{16} \ln(x-2) + c$$

Ou simplificando

$$\frac{-11x^2 + 17x - 4}{8x(x-2)^2} + \frac{3}{16} \ln\left|\frac{x}{x-2}\right| + c$$

$$9) \frac{1}{4} \ln|x| + \frac{63}{4} \ln|x+4| + \frac{x^2}{2} - 4x + c$$

$$10) \frac{x^2}{2} + x + \frac{2}{3} \ln|x+1| + \frac{7}{3} \ln|x-2| + c$$