UNISC UNIVERSIDADE DE SANTA CRUZ DO SUL

TRABALHO DE
FERRAMENTAS MATEMÁTICAS
ENGENHARIAS

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1) Determine a integral indefinida e faça a verificação derivando o resultado.

a) $\int (sen(x) + \cos(x))dx$

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

c) $\int (x^3 + 3x^2 - 2x)dx$

1-a) $\int (sen(x) + cos(x))\, dx$

$\int sen(x)\, dx + \int cos(x)\, dx$

$-cos(x) + sen + C$

$(-cos(x) + sen(x) + C)'$

$+ sen(x) + cos(x)$

c) $\int (x^3 + 3x^2 - 2x) dx$

$\int x^3 dx + 3\int x^2 dx - 2\int x \, dx$

$\frac{x^4}{4} + \frac{\cancel{3}x^3}{\cancel{3}} - \frac{\cancel{2}x^2}{\cancel{2}} + C$

$\left(\frac{\cancel{4}x^3}{\cancel{4}} + x^2 - x^2 + C\right)'$

$x^3 + 3x^2 - 2x$

b) $\int \frac{2x+2}{x^2+2x} dx$ $\quad x(x+2)$

$\frac{A}{x} + \frac{B}{x+2} \to A(x+2) + Bx$

$2\ln|x+2| - \ln|x+2| + \ln|x|$

$\ln|x+2| + \ln|x| + C$

$(\ln|x+2| + \ln|x| + C)'$

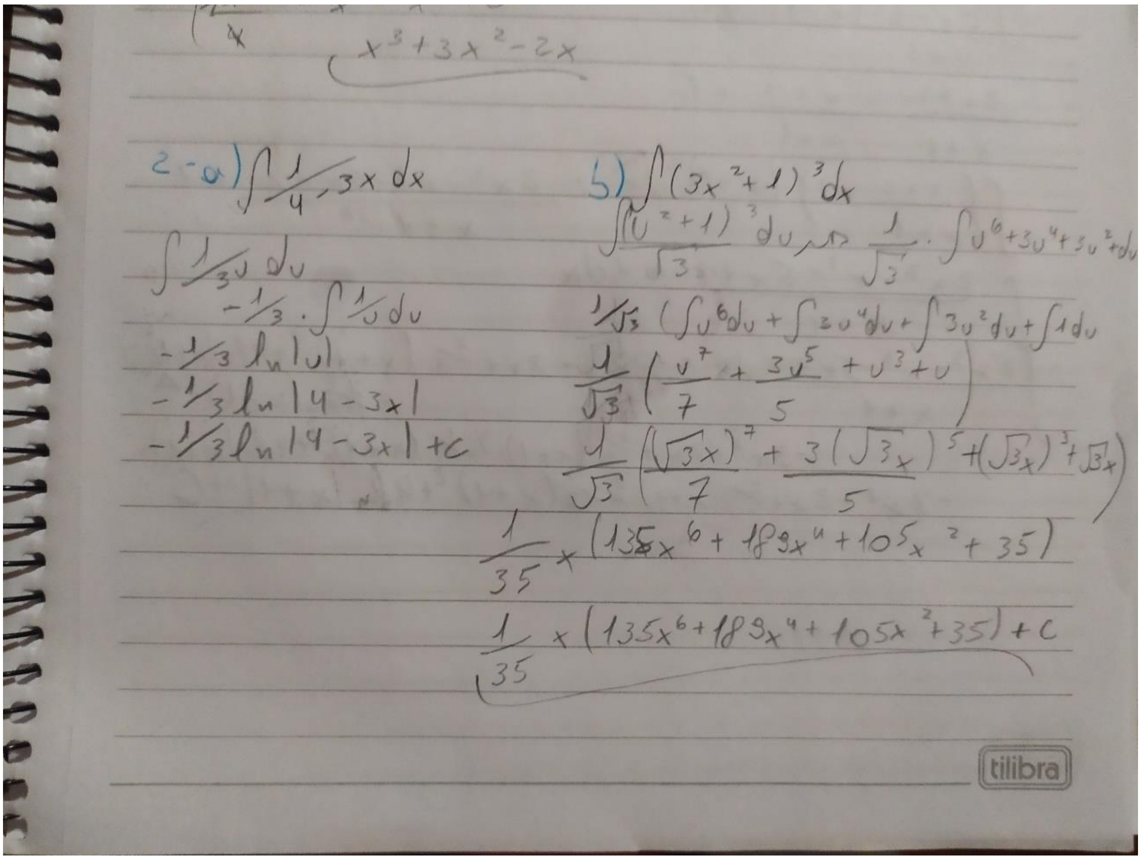
$\frac{1}{x+2} + \frac{1}{x} = \frac{2(x+1)}{x(x+2)}$

$\frac{2x+2}{x^2+2x}$

2) Calcule as integrais indefinidas utilizando o método da substituição.

a) $\int \frac{1}{4-3x} dx$

b) $\int (3x^2 + 1)^3 dx$



$x^3 + 3x^2 - 2x$

2-a) $\int \frac{1}{4-3x} dx$

$\int \frac{1}{-3u} du$

$-\frac{1}{3} \cdot \int \frac{1}{u} du$

$-\frac{1}{3} \ln|u|$

$-\frac{1}{3} \ln|4-3x|$

$-\frac{1}{3} \ln|4-3x| + C$

b) $\int (3x^2+1)^3 dx$

$\int \frac{(u^2+1)^3}{\sqrt{3}} du \rightsquigarrow \frac{1}{\sqrt{3}} \cdot \int u^6 + 3u^4 + 3u^2 + du$

$\frac{1}{\sqrt{3}} \left(\int u^6 du + \int 3u^4 du + \int 3u^2 du + \int 1 du \right)$

$\frac{1}{\sqrt{3}} \left(\frac{u^7}{7} + \frac{3u^5}{5} + u^3 + u \right)$

$\frac{1}{\sqrt{3}} \left(\frac{(\sqrt{3}x)^7}{7} + \frac{3(\sqrt{3}x)^5}{5} + (\sqrt{3}x)^3 + \sqrt{3}x \right)$

$\frac{1}{35} x (135x^6 + 189x^4 + 105x^2 + 35)$

$\frac{1}{35} x (135x^6 + 189x^4 + 105x^2 + 35) + C$

3) Calcule as integrais utilizando o método da integração por partes:

a) $\int x e^{-4x} dx$

b) $\int (2x+1) sen(x) dx$

3 - a) $\int x e^{-4x} dx$

$\frac{\int e^u u \, du}{16}$

$\frac{1}{16} \cdot \int e^u u \, du$

$\frac{1}{16} \left(e^u u - \int e^u du \right)$

$\frac{1}{16} \left(e^u u - e^u \right)$

$\frac{1}{16} \left(e^{-4x}(-4x) - e^{-4x} \right)$

$\frac{1}{16} \left(-4e^{-4x} x - e^{-4x} \right)$

$\frac{1}{16} \left(-4e^{-4x} x - e^{-4x} \right) + C$

b) $\cancel{\int (3x^2+1)^3 dx}$

b) $\int (2x+1) \, \text{sen}(x) \, dx$

$-\cos(x)(2x+1) - \int -2\cos(x) dx$

$-\cos(x)(2x+1) - (-2\sin(x))$

$-\cos(x)(2x+1) + 2\sin(x)$

$-\cos(x)(2x+1) + 2\sin(x) + c$

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

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

4) Calcule a integral $\int \frac{2x+3}{(x+1)(x-1)^2} dx$

4) $$\int \frac{2x+3}{(x+1)(x-1)^2}\,dx$$

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

$$\frac{2x+3}{x+1} = \frac{x+2}{x+1} + 1$$

$$\int \left(\frac{x+2}{x+1} + 1\right)(x-1)^2\,dx \quad : \quad \frac{2x^3-x^2-5x+2}{x+1} + 1$$

$$\int \frac{2x^3-x^2-5x+2}{x+1} + 1\,dx$$

$$\int \frac{2x^3-x^2-5x+2}{x+1}\,dx = -3x^2 - 3x + \frac{2}{3}(x+1)^3 + 4\ln|x+1| - \frac{1}{2}(x+1)^2$$

$$-3x^2 - 2x + \frac{2}{3}(x+1)^3 - \frac{1}{2}(x+1)^2 + 4\ln|x+1|$$

$$-3x^2 - 2x + \frac{2}{3}(x+1)^3 - \frac{1}{2}(x+1)^2 + 4\ln|x+1| + C$$