

lista 4

$$\textcircled{1} a) \int \frac{2x^3}{x^2+1} dx \quad \begin{matrix} 2 \int \frac{x^3}{x(x+1)} & 2 \int \frac{x^0}{x+1} & \begin{matrix} x = u-1 \\ u = x+1 \\ du = dx \end{matrix} \end{matrix}$$

$$\frac{2(u-1)^2}{u} du \quad 2 \int \frac{u^2 - 2u + 1}{u} du \rightarrow 2 \left(\int u du - \int 2 du + \int \frac{1}{u} du \right)$$

$$\frac{2}{2} (u^2 - 2u + \ln(u)) \rightarrow u^2 - 4u + 2\ln(u)$$

$$(x+1)^2 - 4(x+1) + 2\ln(x+1) = x^2 + 2x + 1 - 4x - 4 + 2\ln(x)$$

$$x^2 - 2x - 3 + 2\ln(x+1) + C$$

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

$$3 = A, B, C$$

$$(x+2)(x-2)(x+1)$$

MML

$$\int \frac{x-1}{(x+2)(x-2)(x+1)} = \frac{A}{(x+2)} + \frac{B}{(x-2)} + \frac{C}{(x+1)}$$

$$\frac{x-1}{(x+2)(x-2)(x+1)} = \frac{A(x-2)(x+1) + B(x+2)(x+1) + C(x+2)(x-2)}{(x+2)(x-2)(x+1)}$$

$$x-1 = A(x-2)(x+1) + B(x+2)(x+1) + C(x+2)(x-2)$$

$$x = -1 \Rightarrow -2 = 0A + 0B - 3C \Rightarrow C = \frac{2}{3}$$

$$x = 2 \Rightarrow 1 = 0A + B(4) + 0C \Rightarrow B = \frac{1}{4}$$

$$x = -2 \Rightarrow -3 = 4A + 0B + 0C \Rightarrow A = -\frac{3}{4}$$

$$\int \frac{A}{(x+2)} + \frac{B}{(x-2)} + \frac{C}{(x+1)} = \int \frac{-3/4}{(x+2)} + \int \frac{1/12}{(x-2)} + \int \frac{2/3}{(x+1)}$$

$$= \frac{3}{4} \ln(x+2) + \frac{1}{12} \ln(x-2) + \frac{2}{3} \ln(x+1) + C$$

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

$$\int \frac{2x+1}{(x+2)(2x-1)} = \frac{A}{(x+2)} + \frac{B}{(2x-1)} \Rightarrow \int \frac{2x+1}{(x+2)(2x-1)} = \frac{A(2x-1) + B(x+2)}{(x+2)(2x-1)}$$

$$2x+1 = A(2x-1) + B(x+2)$$

$$x = -2 \quad -3 = -5A + 0B \Rightarrow A = 3/5$$

$$x = 1/2 \quad 2 = 0A + 5/2 B \Rightarrow B = 4/5$$

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

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

$$\frac{x^2}{(x+1)(x-1)(2x-1)} = \frac{A}{(x+1)} + \frac{B}{(x-1)} + \frac{C}{(2x-1)} \Rightarrow x^2 = \frac{A(x-1)(2x-1)}{(2x-1)} + \frac{B(x+1)}{(2x-1)} + \frac{C(x+1)(x-1)}{(2x-1)}$$

$$x = -1 \quad A(6+6) + C(0) = 1 \Rightarrow A = 1/6$$

$$x = 1 \quad A(0) + 2B + C(0) = 1 \Rightarrow B = 1/2$$

$$x = 1/2 \quad A(0) + 0B + (-3/4)C = 1/4 \Rightarrow C = -1/3$$

$$\frac{-1/3}{2x-1} + \frac{1/6}{x+1} + \frac{1/2}{x-1} =$$

$$3 \left(-\int \frac{1}{3(2x-1)} dx + \int \frac{1}{6(x+1)} dx + \int \frac{1}{2(x-1)} dx \right) + C$$

$$A \quad -\frac{1}{3} \int \frac{1}{2x-1} \Rightarrow -\frac{1}{3} \int \frac{1}{2u} \frac{du}{2} \quad B \quad \frac{1}{6} \ln|x+1|$$

$$u = 2x-1 \quad \frac{du}{dx} = 2 \quad \frac{1}{6} \ln|u| \quad C \quad \frac{1}{2} \ln|x-1|$$

$$-\frac{1}{2} \ln|2x-1| + \frac{1}{2} \ln|x+1| + \frac{3}{2} \ln|x-1| + C$$

$$e) \frac{(x^2+5x+9)}{(x^2-2x+1)} = \int \frac{x^2}{(x^2-2x+1)} + \frac{5x}{(x^2-2x+1)} + \frac{9}{(x^2-2x+1)}$$

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

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

$$v = \int 1 dx = x$$

por aqui por não estar dando certo
a questão