Contrôle 3 Corrigé

$$\left[\left(7x^2+2x-1\right)^{15}\right]' = 15\left(7x^2+2x-1\right)^{14}(14x+2) \qquad \left((u^{15})' = 15u^{14}.u'\right)$$

$$\left[\left(4x^3+x-1\right)\left(1+\sin x\right)\right]' = (12x^2+1)(1+\sin x) + \cos x\,(4x^3+x-1)$$

. Primitives

$$\int (7x^3+2x+4)\,dx = \frac{7x^4}{4} + x^2 + 4x + C$$

$$\int (8x^3+1)^{10}\, 24x^2\,dx = \frac{(8x^3+1)^{11}}{11} + C \qquad \text{type } \int u^{10}u' = \frac{u^{11}}{11} + C$$

$$\int e^{5x}(2x^3-x^2+3x-1)\,dx =$$
$$= \frac{e^{5x}}{5}\left(2x^3-x^2+3x-1 - \frac{1}{5}(6x^2-2x+3) + \frac{1}{25}(12x-2) - \frac{1}{125}\times 12\right) + C$$

$$\int \frac{dx}{x-7} = \ln|x-4| + C$$

$$\int \frac{dx}{x^2+8} = \int \frac{dx}{x^2+\sqrt{8}^2} = \frac{1}{\sqrt{8}}\,\mathrm{At}\,\frac{x}{\sqrt{8}} + C$$

$$\int \frac{dx}{(x-1)(x-2)} = \int dx\left(\frac{1}{x-2} - \frac{1}{x-1}\right) = \ln|x-2| - \ln|x-1| + C$$

$$\int \frac{\sin x\,dx}{1+\cos^2 x} = -\int \frac{du}{1+u^2} = -\mathrm{At}\,u + C = -\mathrm{At}(\cos x) + C$$

$\cos x = u$

$du = -\sin x\,dx$

$$\int x^3 \ln x\,dx = \frac{x^4}{4}\ln x - \int \frac{x^3}{4}\,dx = \frac{x^4}{4}\ln x - \frac{x^4}{16} + C$$

$u' = x^3 \quad | \quad u = \frac{x^4}{4}$

$v = \ln x \quad | \quad v' = \frac{1}{x}$

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$\lim_{+\infty} \frac{x^3+x^2-1}{7x^3-x+2} = \lim_{+\infty} \frac{x^3}{7x^3} = 7$

$\lim_{x \to 1^-} \frac{x+3}{(x-1)(x+2)} = \frac{4}{0^- \times 3} = -\infty$

$\lim_{x \to 1^-} \frac{x^2-1}{(x-1)(x+5)} = \lim_{x \to 1^-} \frac{x+1}{x+5} = \frac{1}{3}$

$\int x^2 \, \mathrm{At}x \, dx = \frac{x^3}{3}\mathrm{At}x - \frac{1}{3}\int \frac{x^3 dx}{1+x^2}$

$u' = x^2 \quad u = \frac{x^3}{3}$

$v = \mathrm{At}x \quad v' = \frac{1}{1+x^2}$

$$\begin{array}{r|l} x^3 & x^2+1 \\ \hline -x^3-x & x \\ -x & \end{array}$$

$x^3 = x(x^2+1) - x$

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

$\int x^2 \, \mathrm{At}x \, dx = \frac{x^3}{3}\mathrm{At}x - \frac{1}{3}\int \left(x - \frac{1}{2}\frac{2x}{x^2+1}\right)dx$

$= \frac{x^3}{3}\mathrm{At}x - \frac{x^2}{6} + \frac{1}{6}\ln(1+x^2) + C$

$\int \frac{t^3-t-1}{t^2+1}dt$

$$\begin{array}{r|l} t^3 - t - 1 & t^2+1 \\ \hline -t^3 - t & t \\ -2t-1 & \end{array}$$

$t^3 - t - 1 = t(t^2+1) - 2t - 1$

$\int \frac{t^3-t-1}{t^2+1}dt = \int \left(t - \frac{2t+1}{t^2+1}\right)dt = \frac{t^2}{2} - \ln(1+t^2) - \mathrm{At}(t) + C$

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

$\frac{1}{x(x^2+1)} = \frac{a}{x} + \frac{bx+c}{x^2+1} \qquad a = 1$

$bi + c = \frac{1}{i} = -i \qquad b = -1 \quad c = 0$

$\int \frac{dx}{x(x^2+1)} = \int \frac{1}{x} - \frac{1}{2}\int \frac{2x}{x^2+1} = \ln|x| - \frac{1}{2}\mathrm{At}x + C$

$\int \frac{e^t-1}{e^t+1}dt \qquad e^t = u \quad t = \ln u \quad dt = \frac{du}{u}$

a b c d e

$I = \int \frac{e^t-1}{e^t+1}dt = \int \frac{u-1}{u+1}\frac{du}{u}$

$\frac{u-1}{u(u+1)} = \frac{a}{u} + \frac{b}{u+1} \qquad a = -1 \quad b = +2$

$I = -\int \frac{du}{u} + 2\int \frac{du}{u+1} = \ln|u| + 2\ln|u+1| + C$

$= \ln e^t + 2\ln(1+e^t) + C$

$= t + 2\ln(1+e^t) + C$