Lista 03

① a) $7x^4 - 2x^3 + 8x + 5 = \frac{d}{dx}(7x^4) - \frac{d}{dx}(2x^3) + \frac{d}{dx}(8x) + \frac{d}{dx}(5)$

$28x^3 - 6x^2 + 8 + 0$

b) $4x^3 + x^2 = 12x^2 + 2x$

c) $\sin x + \cos x = \frac{d}{dx}(\sin x) + \frac{d}{dx}(\cos x)$

$\cos x - \sin x$

② $(f \cdot g)' = f \cdot g' + g \cdot f'$

a) $f(x) = (3x^2 + x)(x^3 + x + 1) = (6x+1)(x^3+x+1) + (3x^2+1)(3x^2+x)$

d/dx | $6x+1$ | $3x^2+1$ | $6x^3 + 6x^2 + 6x + x^2 + x + 1 + 9x^4 + 3x^3 + 3x^2 + x$

$15x^4 + 4x^3 + 9x^2 + 8x + 1$

b) $(x^2)' \cdot (x + x^4)(1 + x + x^3)$

$2x$ | $x + x^2 + x^4 + x^5 + x^7$

$x^7 + x^5 + 2x^4 + x^2 + x$

$7x^6 + 5x^4 + 8x^3 + x + 1$

$2x(x + x^4)(1 + x^3) + (7x^6 + 5x^4 + 4x^3 + x + 1) \cdot (x^2)$

$2x^2 + 7x^6 + 5x^4 + 4x^3 + 3x^2$

d) $52(2x+3)^{51} \cdot \frac{d}{dx}(2x+3)$

$52(2x+3)^{51} \cdot (2+0)$

$104(2x+3)^{51}$

e) $x^3 \cdot e^x$

$3x^2 \quad e^x$

$3x^2 e^x + e^x x^3$

$e^x(3x^2 + x^3)$

g) $x^4 \cdot 2^{2x}$

$d/dx^4 x^3$ | $2 \cdot 2^{2x} \ln(2)$

$4x^3 2^{2x} + 2 \cdot 2^{2x} \ln(2) x^4$

$2 \cdot 2^{2x} x^3 (2 + x \ln(2))$

p) $xe^x + \cos x$

d/dx | $e^x + e^x$ | $-\sin x$

π $e^x(1+x) - \sin x$

h) $3^{3x} = 27^x = 27^x \ln(27)$

$\ln(3) + 3^{2x+1}$

i) $e^{5x+1} \cdot \frac{d}{dx}(5x+1)$

$e^{5x+1} \cdot 5$

⑤ $5(\cos x)^4 \times d/dx \cos(x)$ ($-\sin x$)

$-5\cos x^4 \times \sin(x)$

⑥ $\sin^7 x \times \cos^3 x$

$f(x)$ $\cos x$ — f' $-\sin x$

$g(x)$ $\sin^6 \cos x$ — g' $-3\cos^2 x \sin x$

$(7\sin^6 \cos x)\times(\cos^3 x) + (-3\cos^2 x \sin x)(\sin^7 x)$

$7\sin^6 \cos^4 - 3\cos^2 x \sin^8 x$

⑦ $a\sin x + b\cos x$

$a\cos x + (-b\sin x)$

$a\cos x - b\sin x$

⑧ a) $2\, d/dx\,(x^{-7})$

$2 \times -7x^{-8}$

$-\frac{14}{x^8}$

b) $3\, d/dx(x^{-5})$

$3x - 5x^{-6}$

$-\frac{15}{x^6}$

c) $d/dx\,(x^2+x+1)^{-1}$

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

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

d) $\frac{1(x(x-1)-1(x+1)}{(x-1)^2}$

$\frac{-2}{(x-1)^2}$

e) $d/dx\left(\frac{x+3}{x-2}\right) = \frac{5}{(x-1)^2}$

$d/dx\left(\frac{x+2}{x+1}\right) = \frac{-1}{(x+1)^2}$

$4/(x-1)^2 - 1/(x+1)^2 =$

$\frac{-5x^2-6x-5}{(x-1)^2(x+1)^2}$

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

$d/dx(x-2) = 1$

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

$\frac{x^2-4x-7}{(x-2)^2}$

g) $2x\sin(x) = 2x\sin x \cos x\, x^2$

$e^x = e^x$

$\frac{(2x\sin x + \cos x x^2)e^x - e^x x^2 \sin x}{(e^x)^2}$

$\frac{x(x\cos(x) + 2\sin(x) - x\sin(x))}{e^x}$

h) $\cos x = -\sin x$

$xe^x = e^x + e^x$

$\frac{(-\sin(x))\times e^x - (e^x + e^x)\cos x}{(xe^x)^2}$

$\frac{-e^x x\sin(x) - \cos(x)(e^x + e^x)}{e^{2x}x^2}$

(f) a) $\cot x$
$-\operatorname{cosec}^2 x$

b) $\sec x$
$\sec(x) \times tg(x)$

c) $\operatorname{cosec} x$
$-\cot x \operatorname{cosec} x$

d) $tg^2 x$
$2tg\, x \times \frac{d}{dx} \tan x$
$2tg\, x \times \sec^2 x$

e) $\sec x - tg\, x$
$\sec(x) tg(x) - \sec(x)$

f) $\frac{(x+1)}{1}$ | $\frac{tg(x)}{\sec^2 x}$
$1 + tg(x) + \sec^2 x (x+1)$

g) $tg(x) = \sec^2 x$
$\sin(x) + \cos(x) = \cos(x) - \sin(x)$
$\frac{\sec(x)(1 + tg(x)) - tg(x)(\cos(x) + \sin(x))}{1 + \sin(2x)}$

h) $e^{2x} = e^{2x} \times 2$
$\cot^2(x) = -2 \operatorname{cosec}^2(x) \cot(x)$
$2e^{2x} \cot^2(x) - 2e^{2x} \operatorname{cosec}^2(x) \cot(x)$