**❶ Par application directe des règles…**

a) $f'(x) = 26x^{12} - 42x^5 = 2x^5 \cdot (13x^7 - 21)$

b) $f'(x) = 2x \cdot \left(-\frac{2}{4x^2}\right) - \frac{\frac{2}{2x}}{\ln^2(2x)} = -\frac{1}{x} - \frac{1}{x \cdot \ln^2(2x)} = -\frac{1}{x} \cdot \left(1 + \frac{1}{\ln^2(2x)}\right)$

c) $f'(x) = 2x \cdot \sqrt{x^2+3} + x^2 \cdot \frac{2x}{2 \cdot \sqrt{x^2+3}} = \frac{2x \cdot (x^2+3) + x^3}{\sqrt{x^2+3}} = \frac{3x \cdot (x^2+2)}{\sqrt{x^2+3}}$

d) $f'(x) = \frac{30x-1}{15x^2 - x} = \frac{30x-1}{x \cdot (15x-1)}$

e) $f'(x) = \frac{2x-4}{2 \cdot \sqrt{(x-6)(x+2)}} = \frac{x-2}{\sqrt{(x-6)(x+2)}}$

f) $f'(x) = \frac{(\cos(x) + 8x) \cdot 3x^2 - (\sin(x) + 4x^2) \cdot 6x}{9x^4} = \frac{3x^2 \cdot \cos(x) - 6x \cdot \sin(x)}{9x^4} = \frac{x \cdot \cos(x) - 2 \cdot \sin(x)}{3x^3}$

g) $f'(x) = \frac{1}{2 \cdot \sqrt{\ln(4x)}} \cdot \frac{4}{4x} = \frac{1}{2x \cdot \sqrt{\ln(4x)}}$

h) $f'(x) = -\frac{2 \cdot (3-2x) \cdot (-2)}{(3-2x)^4} = \frac{4}{(3-2x)^3}$

i) $f'(x) = 2\sin(15x) \cdot \cos(15x) \cdot 15 = 30\sin(15x) \cdot \cos(15x) = 15\sin(30x)$

j) $f'(x) = -\frac{\frac{3}{3x}}{\ln^2(3x)} = -\frac{1}{x \cdot \ln^2(3x)}$

k) $f'(x) = \left(1 + \tan^2\left(\frac{1}{x^3}\right)\right) \cdot \left(-\frac{3x^2}{x^6}\right) = -\frac{3}{x^4} \cdot \left(1 + \tan^2\left(\frac{1}{x^3}\right)\right)$

l) $f'(x) = \frac{(x^2 - x - 6) - (x-5) \cdot (2x-1)}{(x+2)^2 \cdot (x-3)^2} = \frac{-x^2 + 10x - 11}{(x+2)^2 \cdot (x-3)^2}$

m) $f'(x) = -\sin\left(\sqrt{4x+2}\right) \frac{4}{2 \cdot \sqrt{4x+2}} = -\sin\left(\sqrt{4x+2}\right) \frac{2 \cdot \sqrt{4x+2}}{4x+2} = -\sin\left(\sqrt{4x+2}\right) \frac{\sqrt{4x+2}}{2x+1}$

n) $f'(x) = \frac{-2\cos(2x) \cdot (-\sin(2x)) \cdot 2}{1 - \cos^2(2x)} = \frac{4\sin(2x) \cdot \cos(2x)}{\sin^2(2x)} = \frac{2\sin(4x)}{\sin^2(2x)}$

o) $f'(x) = \cos\left(\frac{3}{2x}\right) \cdot \left(-\frac{3 \cdot 2}{4x^2}\right) = -\frac{3}{2x^2} \cdot \cos\left(\frac{3}{2x}\right)$

p) $f'(x) = -\frac{4\left(-\sin\left(\sqrt{x}\right)\right) \frac{1}{2 \cdot \sqrt{x}}}{\cos^2\left(\sqrt{x}\right)} = \frac{4\sin\left(\sqrt{x}\right)}{2 \cdot \sqrt{x} \cdot \cos^2\left(\sqrt{x}\right)} = \frac{2 \cdot \sqrt{x} \cdot \sin\left(\sqrt{x}\right)}{x \cdot \cos^2\left(\sqrt{x}\right)}$

❷ **Idem…**

a) $f'(x) = 5\cdot e^{2x-3} + 5x\cdot e^{2x-3}\cdot 2 = 5\cdot(1+2x)\cdot e^{2x-3}$

b) $f'(x) = -3\sin(3x)\cdot\ln(x-1) + \cos(3x)\cdot\dfrac{1}{x-1}$

c) $f'(x) = 2x\cdot\cos(x^2)\cdot e^{5+2x} + \sin(x^2)\cdot e^{5+2x}\cdot 2 = 2\cdot(x\cdot\cos(x^2) + \sin(x^2))\cdot e^{5+2x}$

d) $f'(x) = \dfrac{3\cdot e^{2x} - (3x-1)\cdot 2e^{2x}}{e^{4x}} = \dfrac{(4-3x)\cdot e^{2x}}{e^{4x}} = \dfrac{4-3x}{e^{2x}}$

e) $f'(x) = \dfrac{-e^{-x}\cdot 7x - e^{-x}\cdot 7}{49x^2} = -\dfrac{7\cdot(x+1)\cdot e^{-x}}{49x^2} = -\dfrac{x+1}{7x^2\cdot e^{x}}$

f) $f'(x) = -\dfrac{\sqrt{2}\cdot\dfrac{10x}{5x^2}}{\ln^2(5x^2)} = -\dfrac{2\sqrt{2}}{x\cdot\ln^2(5x^2)}$

g) $f'(x) = \dfrac{-6e^{-2x}}{2\cdot\sqrt{3e^{-2x}}} = \dfrac{-3e^{-2x}}{\sqrt{3}\cdot e^{-x}} = -\dfrac{\sqrt{3}}{e^{x}}$

h) $f'(x) = \dfrac{1}{\sqrt{(1-x)(x+3)}}\cdot\dfrac{-2x-2}{2\cdot\sqrt{(1-x)(x+3)}} = -\dfrac{x+1}{(1-x)(x+3)} = \dfrac{x+1}{(x-1)(x+3)}$

i) $f'(x) = \dfrac{2\cdot\sqrt{2x+3} - 2x\cdot\dfrac{2}{2\cdot\sqrt{2x+3}}}{2x+3} = \dfrac{\dfrac{2\cdot(2x+3) - 2x}{\sqrt{2x+3}}}{2x+3} = \dfrac{2x+6}{\sqrt{2x+3}\cdot(2x+3)} = \dfrac{2\cdot\sqrt{2x+3}\cdot(x+3)}{(2x+3)^2}$

j) $f(x) = \cos^2(5x) - 7 + \sin^2(5x) = -6 \quad\Rightarrow\quad f'(x) = 0$

k) $f'(x) = \dfrac{(-2x+3)\cdot e^{3x} - (-x^2+3x-2)\cdot 3e^{3x}}{e^{6x}} = \dfrac{(3x^2-11x+9)\cdot e^{3x}}{e^{6x}} = \dfrac{3x^2-11x+9}{e^{3x}}$

l) $f(x) = e^{2x}\cdot e^{3x} = e^{5x} \quad\Rightarrow\quad f'(x) = 5e^{5x}$

m) $f'(x) = e^{\sqrt{x^2+1}}\cdot\dfrac{2x}{2\cdot\sqrt{x^2+1}} = \dfrac{x\cdot\sqrt{x^2+1}}{x^2+1}\cdot e^{\sqrt{x^2+1}}$

n) $f'(x) = \dfrac{(-e^{-x}-e^{x})\cdot 2x - (e^{-x}-e^{x})\cdot 2}{4x^2} = \dfrac{-2\cdot(xe^{-x}+xe^{x}+e^{-x}-e^{x})}{4x^2} = \dfrac{xe^{-x}+xe^{x}+e^{-x}-e^{x}}{2x^2}$

o) $f'(x) = 2\cos(2x)\cdot\cos(5x) + 5\sin(2x)\cdot(-\sin(5x)) = 2\cos(2x)\cdot\cos(5x) - 5\sin(2x)\cdot\sin(5x)$

p) $f'(x) = \dfrac{2x\cdot\cos(x^2)}{2\cdot\sqrt{\sin(x^2)}} = \dfrac{x\cdot\cos(x^2)}{\sqrt{\sin(x^2)}}$

q) $f'(x) = \dfrac{-\sin\left(\dfrac{1}{x}\right)\cdot\left(-\dfrac{1}{x^2}\right)}{\cos\left(\dfrac{1}{x}\right)} = \dfrac{1}{x^2}\cdot\tan\left(\dfrac{1}{x}\right)$