

5.9

$$\begin{aligned}
1) \quad f'(x) &= ((x+5)(x-3))' \\
&= (x+5)'(x-3) + (x+5)(x-3)' \\
&= 1 \cdot (x-3) + (x+5) \cdot 1 \\
&= x-3 + x+5 \\
&= 2x+2
\end{aligned}$$

$$\begin{aligned}
2) \quad f'(x) &= ((3x^2+5)(x^2-1))' \\
&= (3x^2+5)'(x^2-1) + (3x^2+5)(x^2-1)' \\
&= 6x(x^2-1) + (3x^2+5)2x \\
&= 6x^3 - 6x + 6x^3 + 10x \\
&= 12x^3 + 4x
\end{aligned}$$

$$\begin{aligned}
3) \quad f'(x) &= ((x^2-3)(4x-5))' \\
&= (x^2-3)'(4x-5) + (x^2-3)(4x-5)' \\
&= 2x(4x-5) + (x^2-3)4 \\
&= 8x^2 - 10x + 4x^2 - 12 \\
&= 12x^2 - 10x - 12
\end{aligned}$$

$$\begin{aligned}
4) \quad f'(x) &= ((3x^2-7x)(4x^2-5))' \\
&= (3x^2-7x)'(4x^2-5) + (3x^2-7x)(4x^2-5)' \\
&= (6x-7)(4x^2-5) + (3x^2-7x)8x \\
&= 24x^3 - 30x - 28x^2 + 35 + 24x^3 - 56x^2 \\
&= 48x^3 - 84x^2 - 30x + 35
\end{aligned}$$

5) Montrons la formule

$$(f \cdot g \cdot h)'(x) = f'(x)g(x)h(x) + f(x)g'(x)h(x) + f(x)g(x)h'(x)$$

$$\begin{aligned}
(f \cdot g \cdot h)'(x) &= ((f \cdot g) \cdot h)'(x) \\
&= (f \cdot g)'(x)h(x) + (f \cdot g)(x)h'(x) \\
&= (f'(x)g(x) + f(x)g'(x))h(x) + f(x)g(x)h'(x) \\
&= f'(x)g(x)h(x) + f(x)g'(x)h(x) + f(x)g(x)h'(x)
\end{aligned}$$

$$\begin{aligned}
f'(x) &= ((x-7)(3x+2)(4x^2-3))' \\
&= (x-7)'(3x+2)(4x^2-3) + (x-7)(3x+2)'(4x^2-3) \\
&\quad + (x-7)(3x+2)(4x^2-3)' \\
&= 1(3x+2)(4x^2-3) + (x-7)3(4x^2-3) + (x-7)(3x+2)8x \\
&= (3x+2)(4x^2-3) + (3x-21)(4x^2-3) + (x-7)(24x^2+16x) \\
&= 12x^3 - 9x + 8x^2 - 6 + 12x^3 - 9x - 84x^2 + 63 + 24x^3 + 16x^2 \\
&\quad - 168x^2 - 112x \\
&= 48x^3 - 228x^2 - 130x + 57
\end{aligned}$$

$$\begin{aligned}
6) \quad f'(x) &= ((2x^2 + 3x)(3x^3 - x + 4))' \\
&= (2x^2 + 3x)'(3x^3 - x + 4) + (2x^2 + 3x)(3x^3 - x + 4)' \\
&= (4x + 3)(3x^3 - x + 4) + (2x^2 + 3x)(9x^2 - 1) \\
&= 12x^4 - 4x^2 + 16x + 9x^3 - 3x + 12 + 18x^4 - 2x^2 + 27x^3 - 3x \\
&= 30x^4 + 36x^3 - 6x^2 + 10x + 12
\end{aligned}$$