Rules of (explicit) differentiation

Constants rules
\[ \frac{d}{dx} C = 0 \]
\[ \frac{d}{dx} (f(x) \pm C) = \frac{d}{dx} f(x) \]
\[ \frac{d}{dx} (f(x), C/C) \]
\[ \frac{d}{dx} (C f(x)) = C \frac{d}{dx} f(x) \]
\[ \frac{d}{dx} (f(x)^{-1}) = -f(x)^{-2} \frac{d}{dx} f(x) \]

Multiplication rule
\[ \frac{d}{dx} (f(x) \cdot g(x)) = f(x) \frac{d}{dx} g(x) + g(x) \frac{d}{dx} f(x) \]

Quotient rule
\[ \frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) = \frac{g(x) \frac{d}{dx} f(x) - f(x) \frac{d}{dx} g(x)}{g(x)^2} \]

Composition rule
\[ \frac{d}{dx} f(g(x)) = f'(g(x)) \frac{d}{dx} g(x) \]

Short list of functions
\[ \frac{d}{dx} x = 1 \]
\[ \frac{d}{dx} x^n = nx^{n-1} \]
\[ \frac{d}{dx} e^x = e^x \]
\[ \frac{d}{dx} \ln x = \frac{1}{x} \]
\[ \frac{d}{dx} \sin x = \cos x \]
\[ \frac{d}{dx} \cos x = -\sin x \]
\[ \frac{d}{dx} \tan x = \sec^2 x \]

with chain rule:
\[ \frac{d}{dx} f(u) = f'(u) \frac{du}{dx} \]
\[ \frac{d}{dx} e^u = e^u \frac{du}{dx} \]

All of these rules are useless if you cannot use them in context. For example, if \( PV = C \) (constant) so that \( P = C/V \) or \( V = C/P \), can you evaluate \( dPV/V \) or \( dV/dP \)?