$PV^\gamma = \text{const}$ → Linearize

a) "LOG DIF"

$$\ln(P) + \gamma \ln(V) = \ln(\text{Const})$$

→ recognize that $\left[\int \frac{1}{x} dx\right] = \left[\ln x\right]$

so $$\frac{d}{dx}\left[\int \frac{1}{x} dx\right] = \frac{d}{dx}\left[\ln x\right]$$

$$\frac{dx}{x} = \frac{d}{dx}\left[\ln x\right]$$

$$\Rightarrow \frac{dP}{P} + \gamma \frac{dV}{V} = 0$$

b) write as differential:

$$dP \cdot V^\gamma + \gamma V^{\gamma-1} dV P = 0$$

divide by ~~$\frac{1}{2}$~~ adiabatic eq. state

$$\frac{dP V^\gamma}{P V^\gamma} + \frac{(\gamma V^{\gamma-1} dV)P}{P V^\gamma} = 0$$

$$\frac{dP}{P} + \gamma \frac{dV}{V} = 0$$