[tex42] **Reconstructing the equation of state of a fluid system**

A fluid system is found to have a thermal expansivity $\alpha_p = (nR/pV) + (na/RT^2V)$ and an isothermal compressibility $\kappa_T = (n/V)[Tf(p) + b/p]$, where a, b are constants and $f(p)$ is an unknown function.

(a) Find the function $f(p)$ which makes the two response functions thermodynamically consistent.

(b) Reconstruct the equation of state $V = V(T, p)$ from the two response functions.