BE gas in $D$ dimensions VII: isobaric expansivity

To derive the parametric expression of the isobaric expansivity of the ideal BE gas at $T > T_c$,

$$
T_p \alpha_p = \frac{T_p}{T} \left[ \left( \frac{D}{2} + 1 \right) \frac{g_{D/2+1}(z)g'_{D/2}(z)}{g_{D/2}(z)g'_{D/2+1}(z)} - \frac{D}{2} \right], \quad 
T_p = \left[ g_{D/2+1}(z) \right]^{D/2+1},
$$

where $k_B T_p = \Lambda (p/\Lambda)^{2/(D+2)}$, $\Lambda \equiv h^2/2\pi m$, and $g_n(z)$ are BE functions, establish first the general thermodynamic relation $\alpha_p = \kappa_T (\partial p/\partial T)_v$ with $v = V/N$, the BE-specific relation $C_V = N(D/2)v(\partial p/\partial T)_v$, and the results for $C_V$ and $\kappa_T$ calculated in [tex97] and [tex128].

Solution: