Ideal Bose-Einstein gas: isochores [tsl39]

Isochore at $T \geq T_c$ [tex114]:

$$\frac{p}{p_v} = \frac{g_{\mathcal{D}/2+1}(z)}{\left[g_{\mathcal{D}/2}(z)\right]^{2/\mathcal{D}+1}}, \qquad \frac{T}{T_v} = \left[g_{\mathcal{D}/2}(z)\right]^{-2/\mathcal{D}}.$$

Isochore at $T \leq T_c$ (also valid asymptotically for $T \ll T_v$ in $\mathcal{D} \leq 2$):

$$\frac{p}{p_v} = \left(\frac{T}{T_v}\right)^{\mathcal{D}/2+1} \zeta(\mathcal{D}/2 + 1).$$

Critical temperature:

$$\frac{T_c}{T_v} = [\zeta(\mathcal{D}/2)]^{-2/\mathcal{D}} = \begin{cases} 0 & \mathcal{D} = 1 \\ 0 & \mathcal{D} = 2 \\ 0.527 & \mathcal{D} = 3 \\ 1 & \mathcal{D} = \infty \end{cases}$$

High-temperature asymptotic behavior:

$$\frac{p}{p_v} \sim \frac{T}{T_v} \left[1 - \frac{1}{2^{\mathcal{D}/2+1}} \left(\frac{T_v}{T}\right)^{\mathcal{D}/2}\right].$$