[tex162] Paramagnetic FD gas II: internal energy

From [tsc16] we directly infer the following parametric expression for the internal energy:

$$U = \frac{\mathcal{D}}{2} k_B T \sum_{\sigma=\pm} N_\sigma \frac{f_{\mathcal{D}/2+1}(z_\sigma)}{f_{\mathcal{D}/2}(z_\sigma)}. \tag{1}$$

Show that this result is consistent with the results for S_σ, N_σ, μ_σ, p_σ derived previously by checking Euler's relation $U_\sigma = TS_\sigma - p_\sigma V + \mu_\sigma N_\sigma$.

Solution: