[tex180] Paramagnetic FD gas VIII: magnetization curves at $T > 0$

Establish a procedure for calculating $\bar{M} \doteq M/N$ versus $\hat{H} \doteq H/k_B T_F$ at fixed $\hat{T} \doteq T/T_F$, where

$$\bar{M} = \frac{1}{2} \frac{f_{\mathcal{D}/2}\big(ze^{\hat{H}/2\hat{T}}\big) - f_{\mathcal{D}/2}\big(ze^{-\hat{H}/2\hat{T}}\big)}{f_{\mathcal{D}/2}\big(ze^{\hat{H}/2\hat{T}}\big) + f_{\mathcal{D}/2}\big(ze^{-\hat{H}/2\hat{T}}\big)},$$

$$\hat{T}^{-\mathcal{D}/2} = \Gamma(\mathcal{D}/2+1)\Big[f_{\mathcal{D}/2}\big(ze^{\hat{H}/2\hat{T}}\big) + f_{\mathcal{D}/2}\big(ze^{-\hat{H}/2\hat{T}}\big)\Big],$$

is the paramagnetic representation of the function $\bar{M}(\hat{T}, \hat{H})$ derived in [tsc16]. Produce graphical representations for $\mathcal{D} = 1, 2, 3$ such as shown in [tsc16]. Identify all noteworthy features.

Solution: