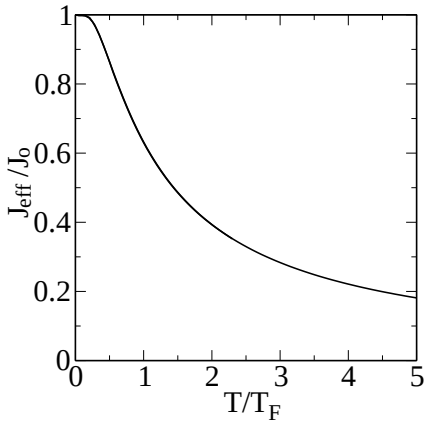
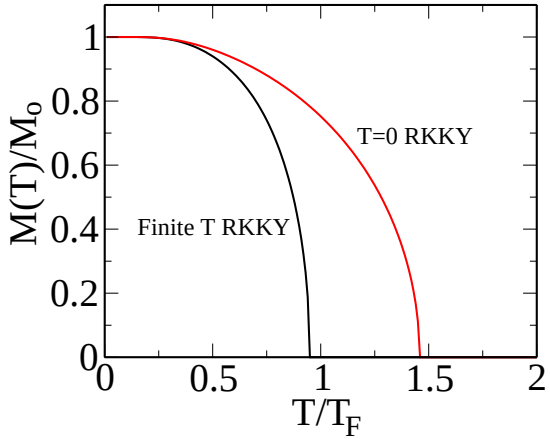
Weiss Mean Field Theory (Continuum Limits)

Magnetization

$$M(T) = B_S\left(S^2 J_{eff}(T) M(T)/k_B T\right)$$ B_S = Brillouin function

$$J_{eff}(T) = x\sum_i J^{RKKY}(R_i, T) \xrightarrow[\text{continuum limit}]{} x\int J^{RKKY}(R,T)d\mathbf{R}$$





Curie Temperature

$$T_c = \frac{S(S+1)}{3k_B} J_{eff}(T_c)$$

$$= \frac{S(S+1)}{12k_B}\int J^{RKKY}(R, T_c)d\mathbf{R}$$

→ self consistent eq.

→ density dependence with J_{eff}

3D : $T_c \propto n^{1/3}$

2D: No n dependence when we use $J^{RKKY}(R,0)$!