Systematic Results in Finite Temperature DFT[1] TAMAS GAL,
JAMES DUFTY, Department of Physics, University of Florida — An exact representation for the non-interacting free energy density functional is identified from
the thermodynamics of a non-uniform, finite temperature system of particles in an
external potential. A formally exact functional density expansion whose leading
term is the Thomas-Fermi approximation is described to second order in the density
non-uniformity. The familiar Perrot form [Phys. Rev. A 20, 586 (1979)] is recovered
from a subsequent smooth gradient expansion. A related formal expansion about
the Thomas-Fermi plus von Weizsacker functional to second order is also described
and discussed.

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