Phy 410
Quiz #9, April 9, 2010

The Fermi energy (FE) of an Ideal gas of spin ½ fermions of mass m and density N/V is given by

$$\varepsilon_F = \frac{\hbar^2}{2m}\left(3\pi^2\frac{N}{V}\right)^{2/3}$$

The Fermi energy of electrons (m=m_e) in metal with density 2.5×10^{28} ($1/m^3$) is 3.1 eV.

(i) What is the FE of electrons in a doped semi-conductor with density $2.5 \times 10^{25} (1/m^3)$

(ii) What is the FE of heavy fermions with mass m=1000m_e with the same metallic density, 2.5×10^{28} ($1/m^3$)?