Phy 410
Quiz #10, April 16, 2010

(1) Plot the Bose-Einstein distribution function $f_{BE}(\varepsilon)$ as a function of ε at a given τ when the chemical potential $\mu = 0.$

(2) The Einstein condensation temperature T_E for bosons of mass M and density N/V is given by

$$T_E = C\frac{(N/V)^{2/3}}{k_B M}$$

Where C is a constant.
For Rb atoms at density 10^{13} /cm^3 T_E is 10^{-7}K. If the density is increased to 10^{16}/cm^3, what will be T_E.

$$Since\ T_E \propto \left(\frac{N}{V}\right)^{2/3};\ T_E = 10^{-7}\,Kx\left(\frac{10^{16}}{10^{13}}\right)^{2/3} = 10^{-5}\,K$$

What is T_E for hydrogen atom if the density is 10^{16}/cm^3.
(Use M_{Rb}=85 amu; M_H=1 amu)

$$Since\ T_E \propto \frac{1}{M};\ T_E = 10^{-5}\,Kx\left(\frac{1/1}{1/85}\right) = 85x10^{-5}\,K$$