Physics 831 Quiz #3 - Friday, Sep. 19

1. The density of single-particle states for a non-interacting Fermi gas has the form, $D(\epsilon) = A\epsilon^{\alpha}$. What is α for a:

   (a) 3-D non-relativistic gas _____

   (b) 2-D non-relativistic gas _____

   (c) 1-D non-relativistic gas _____

   (d) 3-D gas of massless particles _____

   (e) 2-D gas of massless particles _____

   (f) 1-D gas of massless particles _____

2. For a low temperature Fermi gas the excitation energy has the form $E^* = AT^{\alpha}$, where the volume and DENSITY are fixed. What is α for a:

   (a) 3-D non-relativistic gas _____

   (b) 2-D non-relativistic gas _____

   (c) 1-D non-relativistic gas _____

   (d) 3-D gas of massless particles _____

   (e) 2-D gas of massless particles _____

   (f) 1-D gas of massless particles _____

3. For a low temperature Fermi gas the density changes by an amount $\delta\rho = AT^2$, where the volume and CHEMICAL POTENTIAL are fixed. Is A positive, zero or negative for a:

   (a) 3-D non-relativistic gas _____

   (b) 2-D non-relativistic gas _____

   (c) 1-D non-relativistic gas _____

   (d) 3-D gas of massless particles _____

   (e) 2-D gas of massless particles _____

   (f) 1-D gas of massless particles _____