Exercise: Density of States Function Calculation

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1. Calculate the DOS function for a two-dimensional (2D) system and a one-dimensional system. Use the same approach for the calculation of the 3D DOS function that can be found on www.eas.asu.edu/~vasilesk under EEE531 class. Find the relationship between the Fermi level E_F and the electron concentration n for a 2D degenerate electron gas.

2. The dependence of energy on the wavevector for the Γ minimum of the conduction band in GaAs may be approximated by:

$$E(1+\alpha E) = \hbar^2 k^2 / 2m \quad ,$$

where m is the effective mass for E = 0, k is the wavevector and a is the nonparabolicity factor. Calculate the dependence of the effective mass on energy.