PHY 741 – Problem Set #9

Start reading Chapter 4 in **Mahan**; homework is due Monday, September 20, 2010.

Consider a particle of mass m moving in a one dimensional potential:

$$V(x) = \begin{cases} -V_0 \sin(\pi x/a) & \text{for} \quad 0 \le x \le a \\ \infty & \text{otherwise,} \end{cases}$$

where $V_0 = 16 \frac{\hbar^2}{2ma^2}$.

1. Write the Schrödinger equation in dimensionless units $u = x/a$ and $\epsilon = E/(\hbar^2/(2ma^2))$ where E denotes the eigenstate energy.

2. Using one of the numerical methods presented in the Lecture notes of 9/15/2010, estimate the lowest energy eigenvalue ϵ.

3. Use a second approximation to check your answer. (Perhaps use a different number of grid points or use the variational method for example.)