

**PHY 752 – Problem Set #1**

Read Chapters 1-3 in **Martin**: homework is due Friday Jan 14, 2011.

1. Consider an  $N \times N$  Hamiltonian matrix of the form:

$$H = \begin{pmatrix} E_0 & v & 0 & 0 \\ v & E_0 & v & 0 \\ 0 & v & E_0 & v \\ 0 & 0 & v & E_0 \end{pmatrix}, \quad (1)$$

where  $E_0$  and  $v$  are fixed constants.

- (a) Using your favorite software, find the eigenvalues of  $H$  for at least 3 different choices of  $N$ .
- (b) Show that the eigenvalues are consistent with the analytic form we derived in class and find the limiting eigenvalues for  $N \rightarrow \infty$ .