

PHZ3113–Introduction to Theoretical Physics

Fall 2008

Problem Set 12

Oct. 17, 2008

Due: Friday, Oct. 24, 2008

Reading: Boas Ch. 3

1. Boas Probs. 11-12,11-18
2. Boas Prob. 11-36
3. Find the eigenvalues and eigenvectors of

$$\begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}. \quad (1)$$

Note the eigenvectors are not orthogonal.

4. An $N \times N$ matrix A has N eigenvalues A_i . If $B = e^A$, show that B has the same eigenvectors as A , with corresponding eigenvalues B_i given by $B_i = e^{A_i}$.
5. Two equal masses m are connected to each other by a spring of constant k , and then each is connected to walls with springs of constant κ , all in a horizontal line.
 - (a) Write down Newton's equations for both masses.
 - (b) Solve the secular equation for the eigenvectors.
 - (c) Determine the eigenvectors and thus the normal modes of motion.