ASSIGNMENT 7: MATH. PHYS. II

Due May 13h

- **Arfken** (7th edition)

- Exercises: 6.2.9, 6.2.12, 6.2.15.

- A system of N degrees of freedoms is subject to the following potential

$$V = \frac{1}{2} V_{ij} x_i x_j, \qquad i, j = 1, \ldots, N.$$

(i) Derive Newton's second law for the system.

(ii) Assume we are looking for solutions of the form

$$X(t) = X(0) \sin \omega t, \qquad X(t) = \begin{pmatrix} x_1(t) \\ \vdots \\ x_N(t) \end{pmatrix}.$$

Show that $X(0)$ satisfies an eigenvalue problem.

(ii) What are the conditions on the eigenvalues of V_{ij} in order to have normal modes (i.e., oscillatory SH motion with a fixed frequency).

- Consider the previous example with the following potential

$$V = x_1 x_2 + x_1 x_3 + x_2 x_3.$$

Find the normal modes.