1. **Eigenvalue problems.** Write a program that solves the eigenvalue problem

$$Ax = \lambda x, \tag{1}$$

where $A = (a_{ij})_{n \times n}$ is a square matrix and $x = (x_1, \ldots, x_n)^T$ is a vector. Your program should read the matrix A from a file and produce the eigenvalue / vector pairs as output to the screen. Use Numerical Recipes routine `jacobi`. Are eigenvectors of this problem orthogonal?

2. **Eigenvalue problems cont'd.** Write a program that solves the eigenvalue problem

$$Ax = \lambda x. \tag{2}$$

Previously, the problem involved general symmetric matrices. Now, as more efficient methods exist for different types of matrices, solve the problem for (symmetric) tridiagonal A.

Again, your program should read the matrix A from a file and produce the eigenvalue / vector pairs as output to the screen. This time use Numerical Recipes routine `tqli`. If your matrix is not in tridiagonal form use Numerical Recipes routine `tred2`.

3. **Optional Homework Assignment: LAPACK package.** Extremely comprehensive set of well optimized routines for solving eigenvalue problems for different matrix types exist as a part of the `LAPACK`(Linear Algebra PACKage) package.

Improve the program of previous exercise to include routine `SSYEV`, which solves an eigenproblem for a symmetric matrix.

The package is freely available at http://www.netlib.org/lapack/