

## 18.06 Problem Set 9

Due Wednesday, May 2, 2007 at **4:00 p.m.** in 2-106

### Problem 1 Wednesday 4/25

Do problem 7 of section 8.1 in your book.

### Problem 2 Wednesday 4/25

(a) Show that for  $n$  masses joined by  $(n + 1)$  springs with both ends fixed and with all spring constants  $c_i = 1$ , the stiffness matrix is

$$K_n = \begin{bmatrix} 2 & -1 & 0 & 0 & \cdots \\ -1 & 2 & -1 & 0 & \cdots \\ 0 & -1 & 2 & -1 & \cdots \\ & & \ddots & & \\ & & & & \ddots \end{bmatrix}$$

(the  $n \times n$  tridiagonal matrix with 2's on the main diagonal and -1's on the subdiagonal and the superdiagonal.)

(b) Calculate the determinant  $\det(K_n)$ . (Hint: Try to express  $\det(K_n)$  in terms of  $\det(K_{n-1})$  and  $\det(K_{n-2})$ .)

(c) Calculate, the inverse matrix  $K_n^{-1}$ , for  $n = 3, 4, 5$  and try to guess/calculate the answer for general  $n$ .

(d) Find the displacements of the  $n$  bodies. That is, solve  $K_n u = [1, \dots, 1]^T$

### Problem 3 Friday 4/27

Do problem 3 of section 6.6 in your book.

### Problem 4 Friday 4/27

Do problem 11 of section 6.6 in your book.

### Problem 5 Friday 4/27

Do problem 12 of section 6.6 in your book.

### Problem 6 Friday 4/27

Do problem 20 of section 6.6 in your book.

### Problem 7 Monday 4/30

Do problem 7 of section 6.7 in your book.

### Problem 8 Monday 4/30

Do problem 9 of section 6.7 in your book.

**Problem 9** *Monday 4/30*

Do problem 10 of section 6.7 in your book.

**Problem 10** *Monday 4/30*

Do problem 15 of section 6.7 in your book.