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

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

(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 $K_n u = [1, ..., 1]^T$

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.