18.06 - Spring 2005 - Problem Set 4

This problem set is due Wednesday (March 9th), at 4 PM, at 2-106. Make sure to PRINT your **name, recitation number and instructor** on your homework!

Please staple your MATLAB solutions as first pages of your homework.

Lecture 11:

- **Read:** book section 3.6.
- **Work:** book section 3.6 (exercises 4, 25, 26 and 29)

Lecture 12:

- **Read:** book section 8.2.
- **Work:** book section 8.2 (exercises 11 and 17).

Lecture 13:

- **Read:** book section 4.1.
- **Work:** book section 4.1 (exercises 6, 7, 10, 26, 28 and 30).

Lecture 14:

- **Read:** book section 4.2.
- **Work:** book section 4.2 (exercises 4, 13, 17, 19, 27 and 29).

MATLAB Problems

Construct the following 6×6 matrices:

- K = toeplitz ([2, -1, zeros (1, 4)])
- $T = K$; T(1, 1) = 1
- C = toeplitz ([2, -1, zeros(1, 3), -1])

1. C is singular: Explain why. If A is the incidence matrix (Sec. 8.2) for a loop of 6 nodes and edges (a hexagon) verify by hand or MATLAB that $C = A^T A$.
2. The matrix T has a simple inverse inv(T). Find a formula for the i, j entry of T^{-1} when T is $n \times n$.
3. The matrix $K - T$ is certainly a rank one matrix. Compute $T^{-1} - K^{-1}$ (6×6) and express it in the rank one form uv^T. This is an important example of Problem 2.5.43.