18.06 Problem Set 4

Due Wednesday, Mar. 14, 2007 at **4:00 p.m.** in 2-106

Problem 1 *Wednesday 2/28*

Do problem 37 of section 3.5 in your book.

Problem 2 *Wednesday 2/28*

Do problem 28 of section 3.6 in your book (including the challenge problem). For the challenge problem, assume r, n, b, q, k, p are all nonzero.

Problem 3 *Wednesday 2/28*

Using `MATLAB`, take several random 4-by-4 matrices (try using the `rand(m,n)` function) and look at their four subspaces. (A convenient way to calculate the subspaces is the `fourbase.m` teaching code; type in `type fourbase` at the `MATLAB` prompt for information on how to use it.[1]) What are the dimensions of the four subspaces for a "typical" 4-by-4 matrix? Can you explain why? *(Hint: what are the odds a pivot is exactly zero?)*
Now try 4-by-2 matrices. What are the dimensions of the four subspaces now? Now guess what dimensions the four subspaces of a random m-by-n matrix will most likely have.

Problem 4 *Wednesday 3/7*

Do problems 11 and 12(a) of section 8.2 in your book.

Problem 5 *Friday 3/9*

Do problem 17 of section 4.1 in your book.

Problem 6 *Friday 3/9*

Do problem 25 of section 4.1 in your book.

Problem 7 *Friday 3/9*

Do problem 29 of section 4.1 in your book.

Problem 8 *Monday 3/11*

Do problem 17 of section 4.2 in your book.

Problem 9 *Monday 3/11*

Do problem 23 of section 4.2 in your book.

[1] If you need to download the file `fourbase.m` from the Web site, don't forget to put it in the current directory where `MATLAB` can find it.

Problem 10 *Monday 3/11*

We found in class an expression for the projection matrix P that projects a vector b onto the column space of a matrix A.
(a) Find a matrix M that projects a vector onto the left nullspace of A.
(b) What is the product PM? Explain your answer.