# 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.