18.06 (Fall '12) Problem Set 2

This problem set is due Thursday, September 20, 2012 by 4pm in 2-255. The problems are out of the 4th edition of the textbook. For computational problems, please include a printout of the code with the problem set (for MATLAB in particular, `diary("filename")` will start a transcript session, `diary off` will end one, also copy and paste usually works as well.)

1. Do Problem 5 from 2.6.
2. Do Problem 13 from 2.6.
3. Do Problem 15 from 2.6.
4. Do Problem 24 from 2.7. Writing only the solution is not enough to get full credit. You need to show the steps you used to get to the solution.
5. What are the n-dimensional vectors $v = (v_1, \cdots, v_n)$ such that $Pv = v$ for all permutation matrices P.
6. Do Problem 40 from 2.7.
7. Do Problem 10 from 3.1.
8. Do Problem 24 from 3.1.
9. Write a program that somehow computes a polynomial or the coeffcients of a polynomial whose roots are $17, a$, and b. In MATLAB the command `poly([17 a b])` will produce the coeffiecients, highest degree first. If you want to be very fancy, (OPTIONAL) the command `f=@(a,b) poly([17 a b])` will let you type `f(a,b)` for many specific parameter values. Is it true or not true that all polynomials $c_0x^3 + c_1x^2 + c_2x + c_3$ with a root at x=17 form a vector space? Is it true that the coefficients that you calculated form a vector space? Explain and contrast.
10. Use the computer to explore powers of the upper triangular ones matrix. In MATLAB, it would be `triu(ones(n),1)`, of course n needs to be assigned first. In general it is the matrix A_{ij} which is 1 if $j > i$. We would like you to figure out the column space of A^k based on your computational observations for $k = 1, 2, 3, ...$ and for any n.

18.06 Wisdom: Theory is neither as important as mathematicians tell you nor as useless as engineers tell you.