Assignment #9

Due in lecture **Friday, June 5 (not Wednesday)**

Problems to do but not hand in:

Z-1, Z-5;

AA-1;

BB-1, BB-3, BB-4, BB-5, BB-6, BB-8, BB-11.

Problems to hand in:

Z-2, Z-3, Z-4, Z-6;

AA-2;

BB-2, BB-7, BB-9, BB-10.

Problem AA-1. Show that if a square matrix A is similar to a "scalar" matrix rI then $A = rI$. In other words, a scalar matrix is not similar to any matrix except itself.

Problem AA-2. (a) Consider the matrix $N = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$. Show that $N^3 = O$, the zero matrix.

(b) A matrix A is said to be *nilpotent* if some power of A is O. Invent a 2×2 nilpotent matrix following the same idea as in (a).

(c) Show that the examples in (a) and (b) are *not* diagonalizable. (Method: Let N be the example in (b). Suppose $P^{-1}NP = D$. What do you know about N^2 compared to D^2? What would D have to be? Then how about N?)