

## Math 1553 Supplement §5.1, 5.2

### Supplemental Problems

For those who want additional practice problems after completing the worksheet, here are some extra practice problems.

1. Find a basis  $\mathcal{B}$  for the  $(-1)$ -eigenspace of  $Z = \begin{pmatrix} 2 & 3 & 1 \\ 3 & 2 & 4 \\ 0 & 0 & -1 \end{pmatrix}$
2. Suppose  $A$  is an  $n \times n$  matrix satisfying  $A^2 = 0$ . Find all eigenvalues of  $A$ . Justify your answer.
3. Give an example of matrices  $A$  and  $B$  which have the same eigenvalues and the same algebraic multiplicities for each eigenvalue, but which are *not* similar. Justify why they are not similar.
4. Using facts about determinants, justify the following fact: if  $A$  is an  $n \times n$  matrix, then  $A$  and  $A^T$  have the same characteristic polynomial.
5. Play tic-tac-toe for determinants! Instead of X against O, we have 1 against 0. The 1-player wins if the final matrix has nonzero determinant, while the 0-player wins if the determinant is zero. You can change who goes first, and you can also modify the size of the matrix.

Click the link [here](#), or copy and paste the url below:

<http://people.math.gatech.edu/~jrabinoff6/1718F-1553/demos/tictactoe/tictactoe.html>