

Turn this in by making a pdf scan of your work and submitting it to Canvas by 11:59 pm on the due date.

How to write up homework. Please put your name and assignment number on the first page. You may use this page as a cover sheet. Show your work and explain it. In general, just writing down an answer without showing the steps to arriving at the answer is not sufficient for credit.

Current reading is Chapter 2 of Linear Algebra Done Wrong (LADW).

1. Let  $M_{3 \times 3}$  denote the vector space of all  $3 \times 3$  matrices with real entries. Let

$$W = \{\vec{m} \in M_{3 \times 3} \mid \text{all row and column sums of } \vec{m} \text{ are zero}\}.$$

Find  $\dim W$ , the dimension of  $W$ , by the following method:

First, put the matrix  $C$  from part 3 of Lab G (or use the matrix  $C$  given in the solutions to Lab G) into reduced row echelon form. (I recommend using Matlab for this. If you do this by hand, check your work with another person in the class before proceeding.)

Second, apply Theorem 7.2 (p. 64) in LADW to compute  $\dim V$ , for the subspace  $V$  defined in Lab G.

Finally, find  $\dim W$  by using the fact that  $T : M_{3 \times 3} \rightarrow \mathbb{R}^9$  defined in Lab G is an isomorphism.

2. In problem 7.3 (p. 67) of LADW, there are two matrices. Let  $A$  be the  $4 \times 5$  matrix in this problem. Find bases for  $\text{Nul } A$ ,  $\text{Ran } A$  (which is the same as  $\text{Col } A$ ), and  $\text{Ran } A^T$  (which is also called the row space of  $A$ ).

3. For the matrix

$$A = \begin{pmatrix} 1 & i \\ i & -1 \end{pmatrix}$$

compute  $\text{Nul } A$ ,  $\text{Ran } A$ , and  $\text{Ran } A^T$ .

4. Do problem 8.3 on page 73 of LADW.