

Math 461/561 Homework #1: Due Tuesday September 8

0. Read Chapter 1.

1. Show that $\beta = \{(1, 1, 0), (1, 0, 1), (0, 2, 1)\}$ is a basis of \mathbb{R}^3 .

2. Check that $T(x, y) = (2x + y, x + y, x - y)$ is a linear map from $\mathbb{R}^2 \rightarrow \mathbb{R}^3$. Then write the matrix of T in terms of the standard bases.

3. Let T be a linear map on \mathbb{R}^2 with $T(2, 1) = (5, 2)$ and $T(1, 2) = (7, 10)$. Determine the matrix of T with respect to the basis $\beta = \{(1, 2), (1, -1)\}$.

4. Let

$$A = \begin{pmatrix} 1 & -1 & 2 \\ 4 & 0 & 5 \\ -1 & -3 & 1 \end{pmatrix}.$$

Determine the characteristic polynomial of A .

5. Let $T : U \rightarrow V$ and $S : V \rightarrow W$ be linear transformations. Prove that the composition $S \circ T : U \rightarrow W$ is a linear transformation.

6. Book exercises 1.2, 1.3 and 1.6