

MATH 700
HOMEWORK 8

Due Friday, October 31, 2003 at the beginning of class.

1. Let $T: \mathbb{R}^4 \rightarrow \mathbb{R}^4$ be the linear transformation which is given by multiplication by the matrix

$$A = \frac{1}{4} \begin{bmatrix} 6 & 1 & 0 & -1 \\ -2 & 2 & -2 & 0 \\ 0 & 1 & 6 & 1 \\ 2 & 0 & -2 & 2 \end{bmatrix}.$$

Find a basis \mathcal{B} for \mathbb{R}^4 so that the matrix of T with respect to \mathcal{B} is

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}.$$

2. Let r_1, r_2, \dots, r_n be elements of the commutative ring R . What is the determinant of the $n \times n$ matrix

$$M = \begin{bmatrix} 1 & \dots & 1 \\ r_1 & \dots & r_n \\ \vdots & & \vdots \\ r_1^{n-1} & \dots & r_n^{n-1} \end{bmatrix}?$$

Prove your answer.