

Linear Algebra (Math 220)

Assignment due Tuesday, April 15

1 Preparation

Relevant Reading:

Course notes on “change of basis”¹ (also available as PDF²)
Lay § 4.7
Hefferon § 3.V

2 Exercises

1. Find the determinant of the 4×4 matrix

$$\begin{pmatrix} 1 & 2 & -4 & 1 \\ -2 & 10 & -1 & 1 \\ 1 & 0 & 1 & 5 \\ 2 & -9 & 1 & 0 \end{pmatrix} .$$

2. Express the 3×3 matrix

$$\begin{pmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ -1 & 2 & -2 \end{pmatrix}$$

as a product of elementary matrices.

3. Find the matrix with respect to the standard basis of \mathbf{R}^2 of the reflection in the line through the origin that has angle of elevation $\theta/2$ (counterclockwise from the positive direction along the first coordinate axis).
4. Find the matrices for change of basis in both directions between the standard basis of \mathbf{R}^3 and the basis formed by the columns of the matrix

$$\begin{pmatrix} 3 & 2 & 4 \\ 2 & -3 & 1 \\ 3 & -6 & 1 \end{pmatrix} .$$

5. Let f be the linear function from \mathbf{R}^3 to \mathbf{R}^3 given by $f(x) = Mx$ where

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

Find the matrix of f relative to the basis of \mathbf{R}^3 given by the columns of the matrix in the preceding exercise.

¹URI: <http://math.albany.edu/math/pers/hammond/course/mat220s2008/mab.xhtml>

²URI: <http://math.albany.edu/math/pers/hammond/course/mat220s2008/mab.pdf>