

Supplementary Homework # 1
Math 341 - Fall 2002
Prof. John A. Pelesko

This assignment supplements the homework assignments from your text. The material below follows the presentation in class rather than the presentation of your text.

(1) For each of the transformations below determine whether or not they represent a *linear* transformation. Also, determine where the transformation acts and where it sends vectors to.

(a) $f(y) = \sin(y)$, $y \in \mathbf{R}$.

(b)

$$f\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} x + 2y \\ y - x \end{bmatrix}$$

(b)

$$f\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} x^2 + 2y \\ y - x \end{bmatrix}$$

(2) Consider the transformation

$$f\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} x + 2y \\ y - x \\ x + y + z \end{bmatrix}$$

(a) Where does f act? That is, f takes vectors from where to where?

(b) Show that f is linear.

(c) Compute the matrix corresponding to f .

(3) Suppose $f : \mathbf{R}^3 \rightarrow \mathbf{R}^3$ produces the output below. Decide whether or not f is linear. When f is linear, find the matrix corresponding to f .

(a)

$$\begin{bmatrix} x + 2y - z \\ y - x \\ x + y + z \end{bmatrix}$$

(b)

$$\begin{bmatrix} x + 2y - z + 3 \\ y - x \\ x + y + z \end{bmatrix}$$

(c)

$$\begin{bmatrix} x + 2y - \sin(z) \\ y - x \\ x + y + z \end{bmatrix}$$