

Math 220 Assignment

October 15, 2001

Due Wednesday, October 17

1. Let f be a linear map from \mathbf{R}^3 to \mathbf{R}^3 for which

(a) $f(1, 0, 0) = (1, 2, 3)$.

(b) $f(0, 1/2, 0) = (3, 2, 1)$.

(c) $f(-1, 0, 2) = (4, -6, 2)$.

Find all possible 3×3 matrices A for which the formula $f(x) = Ax$ is valid for all x in \mathbf{R}^3 .

Hint: Use the rules for abstract linearity to work out what happens under f to $(0, 1, 0)$ and $(0, 0, 1)$.

2. Let g be the linear map from \mathbf{R}^4 to \mathbf{R}^4 that is defined by $g(x) = Bx$ where B is the matrix

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

Find a 4×4 matrix C for which the linear map h given by multiplication by C has the property that both $h(g(x)) = x$ and $g(h(y)) = y$ for all x and all y in \mathbf{R}^4 .

3. Could the previous exercise have been completed successfully if the given matrix B had been one of the matrices appearing in the assignment due Friday, October 12¹?

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<http://math.albany.edu:8000/math/pers/hammond/course/mat220/assgt/la011015.html>

¹URI: <http://math.albany.edu:8000/math/pers/hammond/course/mat220f2001/assgt/la011010.html>