

Math 220 Assignment

September 24, 2001

Assignment for Wednesday, September 26

Let G be the 4×4 matrix

$$\begin{pmatrix} 1 & 2 & 0 & 1 \\ -2 & -1 & 1 & 1 \\ -1 & 4 & 2 & 5 \\ 5 & 7 & -1 & 2 \end{pmatrix},$$

and let f be the linear map (or function) from \mathbf{R}^4 to \mathbf{R}^4 defined by the formula

$$y = f(x) = Gx \quad .$$

1. Solve each of the following systems of 4 linear equations in 4 unknowns x_1, x_2, x_3 and x_4 .
 - (a) $f(x) = (0, 0, 0, 0)$.
 - (b) $f(x) = (1, -1, 1, 3)$ with $x_3 = 0$.
 - (c) $f(x) = (1, -1, 1, 4)$ with $x_3 = 0$.
 - (d) $f(x) = (1, -1, 1, 4)$ with $x_3 = x_4 = 0$.
 - (e) $f(x) = (3, -1, 2, 1)$ with $x_3 = 0$.
 - (f) $f(x) = (3, -1, 7, 10)$ with $x_3 = 0$.
2. Answer the following questions:
 - (a) What is the kernel of f ?
 - (b) Find equations that characterize the image of f .
3. For each part of the first preceding problem if there are solutions find a solution s and a minimal set u, v, \dots of vectors such that the most general solution of the system is the sum of s and an arbitrary linear combination of the vectors u, v, \dots .

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<http://math.albany.edu:8000/math/pers/hammond/course/mat220/assgt/1a010924.html>