

Math 220 Assignment

October 29, 2001

Due Wednesday, October 31

1. Let f be the linear function from \mathbf{R}^5 to \mathbf{R}^5 that is defined by $f(x) = Mx$ where M is the 5×5 matrix

$$\begin{pmatrix} -1 & 1 & 5 & 1 & 4 \\ 2 & -1 & 2 & 1 & 3 \\ 1 & 0 & -2 & 2 & -1 \\ -2 & 2 & 1 & 2 & 0 \\ -4 & 3 & 8 & 1 & 5 \end{pmatrix} .$$

Find the following:

- A linearly independent set K of vectors in \mathbf{R}^5 such that every element of the kernel of f is a linear combination of the vectors in K .
 - A non-redundant list of linear equations that characterize the image of f as a subset of \mathbf{R}^5 .
2. Let \mathcal{P}_d denote the vector space of polynomials of degree d or less. If f is an element of \mathcal{P}_d , let I_f be the polynomial given by the formula

$$I_f(x) = \int_0^x f .$$

- Explain briefly why I_f is abstractly linear.
- What is the kernel of I_f ?
- In what set does the function I_f take its values? (The domain of I_f is understood here to be \mathcal{P}_d .)

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<http://math.albany.edu:8000/math/pers/hammond/course/mat220/assgt/1a011029.html>