Math 220 Assignment

September 21, 2001

Assignment for Monday, September 24

1. Prepare for the short quiz, which has been deferred.

2. Let C be the 4×4 matrix
$$\begin{pmatrix} 1 & 2 & 0 & 2 \\ -2 & -1 & 3 & 2 \\ -2 & 2 & 6 & -1 \\ 1 & 0 & -2 & 0 \end{pmatrix},$$
and let f be the linear map (or function) from $\mathbf{R}^4$ to $\mathbf{R}^4$ defined by the formula
$$y = f(x) = Cx \quad .$$
   (a) Find all solutions of $f(x) = (0, 0, 0, 0)$.
   (b) Find all solutions of $f(x) = (1, -2, -2, 1)$ with $x_3 = 0$.
   (c) Find all solutions of $f(x) = (1, -2, -2, 1)$.
   (d) Find all solutions of $f(x) = (-1, -7, 2, 1)$ with $x_3 = 0$.
   (e) Find all solutions of $f(x) = (-1, -7, 2, 1)$.
   (f) What is the kernel of f?
   (g) Find equations that characterize the image of f.

3. Let M be an $m \times n$ matrix, and let $\varphi(x) = Mx$. Let a and b be any two points of $\mathbf{R}^n$. Show that $\varphi(a) = \varphi(b)$ if and only if $a - b$ lies in the kernel of φ.

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