Math 115AH Linear Algebra. Homework 6

Burt Totaro

Due Friday, November 6.

Problems from Hoffman-Kunze:

Section 3.5: 1, 2, 3, 8, 11, 12, 16, 17. It might be more efficient to do 17 before 16.

Section 3.7: 2, 4, 6.

(1) Let V and W be vector spaces over a field F, with $n = \dim(V)$ and $m = \dim(W)$. Let $f\colon V \to W$ be a linear map. Show that there is a basis for V and a basis for W in which f is given by the $m \times n$ matrix

$$\begin{pmatrix} 1 & 0 & 0 & \cdots \\ 0 & 1 & 0 & \cdots \\ 0 & 0 & 0 & \cdots \end{pmatrix}$$

That is, I mean the matrix with some 1's along the diagonal starting at the upper left, and everything else zero. Also, show that the number of 1's is the rank of f.

Why does this result not imply that every square matrix is conjugate to one of the form above?