

M 340 L - Quiz 3

06-17-08

1 Exercise 1.9, # 27 (solution)

The standard matrix of T is

$$A := \begin{pmatrix} 1 & -5 & 4 \\ 0 & 1 & -6 \end{pmatrix}$$

(1) T is *not* onto-to-one because A has more columns than rows. (Or because not every column is a pivot column).

(2) T is onto because each row has a pivot. (Or because there are not zero rows).

2 Some comments

There were some massive mistakes that I would like to address.

1. This was a common answer to (2):

“ T is onto because it maps \mathbb{R}^3 to all of \mathbb{R}^2 .”

Do you see what’s wrong here? You are not giving a reason why T is onto, you are simply stating the *definition* of being onto. It’s like if I said:

“I want to go to the movies because I want to go to the movies.”

That’s not logical, do you see it? A valid reason would be, for instance:

“I want to go to the movies because I want to watch that film on the big screen.”

Hope you can understand the point.

2. Another common answer for (2) was:

“ T is onto because the system is consistent.”

The system being consistent only means that there is at least one solution; and being inconsistent means that there is no solution at all.

I think you might be confusing the matrix A with the *augmented* matrix of some system. If that's the case, you need to go to office hours and get this issue clarified. (But even if A were an augmented matrix, it wouldn't be that one of an inconsistent system, would it?)

3. Be careful on your syntax. For instance, what is wrong with the following statement?

“Not all columns of T are pivot columns, so T is linearly dependent.”

First of all, T doesn't have any columns, it's matrix A does.

Second, if you say that A is linearly dependent, then you are talking about linear dependency of *matrices*, which is a problem in a different dimension.

What you want to say here is not that the matrix is linearly dependent but that its *columns* are. A correct version of the statement would be: “Not all columns of

A are pivot columns, so they are linearly dependent columns.”