

Newberger Math 247 Spring 03

**Writing Assignment Suggestions For “Linear Independence”** Here are

some ideas about which you may write for the writing assignment due Monday February 25th. The assignment is “Write about linear independence” (350 words). You may use any or none of these ideas.

- Relate the linear independence of a set of vectors  $\{\mathbf{v}_1, \dots, \mathbf{v}_n\}$  to the span of that set of vectors,  $\text{Span}\{\mathbf{v}_1, \dots, \mathbf{v}_n\}$ .
- Explain why saying the matrix equation  $[\mathbf{v}_1, \dots, \mathbf{v}_n]\mathbf{x} = \mathbf{0}$  has nontrivial solutions means one of the vectors  $\mathbf{v}_i$  can be written in terms of the other vectors in the list.
- Explain why having a pivot in every column in the matrix  $[\mathbf{v}_1, \dots, \mathbf{v}_n]$  means none of the vectors can be linear combinations of the others.
- Use linear independence to understand (better than in the last assignment) the span of three vectors in  $\mathbb{R}^3$ .
- Look at the Theorems in Section 1.7; can you explain why they are true? What examples work well to illustrate the concepts in the theorems. Why do they work well?
- If you are planning to teach math, you might be interested in thinking about how to best explain mathematical concepts. Look at the author’s use of examples to illustrate the concepts in the section on linear independence. How does the author use the examples pedagogically? To warm up the reader before explaining a difficult concept? To reinforce ideas from previous chapters? Focus on the concepts and what is difficult about them, and how the author tries to combat that difficulty. (Make sure you discuss linear independence in particular for this assignment!)
- Challenging idea: When you write a solution set of a homogeneous equation  $A\mathbf{x} = \mathbf{0}$  in parametric vector form, are the vectors that show up in your solution always linearly independent? Suggestion: try some examples by making up a homogeneous equation, solving it, putting the solution in parametric vector form and looking at the vectors that you get.

It might be a good idea to start with the definition of a linearly independent set. Expand on your ideas by making up examples of the concepts you are discussing. If you notice a pattern in what is occurring in your examples, try to explain that pattern. Maybe invent a Theorem based on your observations and explain why it is correct?