#ret #hw

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# 1 | 2.A Exercises

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Please reconsider the questions from Friday now that we have discussed them and part of Chapter 2.A. Do

Be sure to try a few problems, so you have some ideas to share with your classmates on Thursday! Ideall

And if you haven't brought in your old quizzes, please be sure to do so!
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### 1.0.1 | Linear Dependence Lemma

- Why do we care that j is the largest element? #question
  - So we can add up everything before it? Just arbitrary?
- How does 2.22 work? #question
  - To get to 2.22, subtract everything but $a_j v_j$ from both sides of $a_1 v_1 + ... + a_m v_m = 0$
  - Everything past $v_j$ has to equal 0.
  - So we get $a_j v_j = -a_1 v_1 - ... - a_{j-1} v_{j-1}$
  - Divide by $a_j$ and we get 2.22
  - Thus, $v_j$ is a linear combination of the other vectors
  - And in the $span(v_1, ..., v_j - 1)$
- What $v_j$ is it replacing? #question
  - It's replacing what's in the "…", which is unclear.. is $v_j$ actually in the equation then? Or just in the value? #question
  - Now, we can remove the $j^{th}$ finally, and represent it as the linear combination of the previous elements
  - $\therefore$ any element of the span can be represented without $v_j$

### 1.0.2 | A few problems

~Fibonacci!

1. excr. 3 Find a number $t$ such that $(3, 1, 4), (2, -3, 5), (5, 9, t)$ is not linearly independent in $R^3$ ***** Set up system of equations, $3a + 2b = 5$ $a - 3b = 9$ $4a + 5b = t$

   solve, get $b = -2$ and $a = 3$ plug it back in, $4(3) + 5(-2) = 2 = t$

   **answer: 2**

   *ah, 2.2 != 2.20 – nice.*

2. excr. 5
   (a) show that if we think of C as a vector space over **R**, then the list (1+i, 1-i) is linearly **independent.**
   (b) show that if we think of C as a vector space over **C**, then the list (1+i, 1-i) is linearly **dependent.**

Means: use scalars from R in the vector space C? *

(a) $a(1+i)+b(1-i)=0$

prove that the only values of $a$ and $b$ are 0, thus satisfying the linear independence definition.

move i to only one side, $a+b=i(b-a)$ since $a+b$ comes from R, and R is closed under addition, $a+b$ cannot have a complex component. $\therefore a$ and $b$ must $=0$

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(a) $a(1+i)=b(1-i)$

let $b=i$ let $a=1$

$i(1-i)=i-i^2=1+i \therefore$ we can represent $(1-i)$ in terms of $(i+1)$ with scalars from C, and thus, it is linearly dependent.

3. excr. 8 prove or give a counterexample: If $v_1, v_2, ..., v_m$ is a linearly independent list of vectors in V and $\lambda \in F$ with $\lambda\ !=0$, then $\lambda v_1, \lambda v_2, ..., \lambda v_m$ is linearly independent. *

   $a_1v_1+a_2v_2+...+a_mv_m=0$ only if all scalars are equal to 0, as given in the definition

   $\lambda(a_1v_1+a_2v_2+...+a_mv_m)=0$ $\lambda \cdot 0=0$ $\lambda a_1v_1+\lambda a_2v_2+...+\lambda a_mv_m=0$ only if all scalars are equal to 0 $\therefore \lambda v_1, \lambda v_2, ..., \lambda v_m$ is linearly independent.

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Draws from: KBxLinearIndependence KBxSpansLinAlg