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David Eisenbud <de@berkeley.edu>

Re: Chapter 14

1 message

Izzet Coskun <coskunizzet@gmail.com> Wed, Nov 22, 2023 at 10:59 AM
To: David Eisenbud <de@berkeley.edu>
Cc: Joe Harris <harris@math.harvard.edu>

Dear David and Joe,

I would be tempted to split the difference.
If I were teaching out of this book, I might reorder the chapters.
My first instinct (and I am not sure this is sensible, I will have to go back and think about it), would be to
1) Do the Riemann-Roch Theorem and Riemann-Hurwitz
2) Then do g=0,1,2,3 (even before introducing Jacobians). The canonical g=3 curves would already introduce plane curves.
3) I would then do plane curves in greater detail. I would probably ignore Section 14.3 and do plane curves with ordinary singularities in detail and work out a few examples with cusps, tacnodes etc by explicitly finding a log resolution and reading everything from the log resolution. I might mention Theorem 14.3.3, but skip the proof.
4) I would then do g=4 and 5, possibly after introducing Jacobians and W_d^r's.
5) I would then introduce the BN theorem and do g=6 and maybe do the Mukai models of some higher genus curves (I still have a few chapters left to read, but if you don't already have them, you might want to introduce some of these at least as exercises).
6) Somewhere in there I would prove (or babble about) the BN theorem and the ideal of a canonical curve.
I am not sure I would spend as much time on M_g or the Hilbert scheme or I would move those chapters (6 and 7, I believe) to the end. I would mention that Hilbert schemes and M_g exist and mention a few of their properties, in the spirit of your Cheerful Facts, but I would skip the stuff about the construction. I would do Riemann's count and various heuristic counts in terms of explicit descriptions in small genus.

The course that I have in mind is our course on Riemann surfaces. The two main theorems that are missing from this outline are the Uniformization Theorem and the fact that every compact Riemann surface is an algebraic curve. I would probably still use Forster or the equivalent to give a flavor of those two theorems. You might want to mention these two theorems somewhere in the beginning.

Best, Izzet

On Wed, Nov 22, 2023 at 12:44 PM David Eisenbud <de@berkeley.edu> wrote:

> Dear Izzet,
>
> We debated moving Ch 14 to become Ch 3 -- I was in favor, on the grounds that it shows that the abstract stuff in Ch 2 is concrete, but Joe argued that it was more important to get on with the first chapter of examples (curves of genus 0,1).
>
> I'm curious how you see this...
>
> Cordially,
>
> David
> --
> David Eisenbud
> Professor of Mathematics
> University of California Berkeley
> https://eisenbud.github.io/
>
> On Wed, Nov 22, 2023 at 8:06 AM Izzet Coskun <coskunizzet@gmail.com> wrote:
>
> > Dear Joe and David,

Here are some thoughts on Chapter 14. I'll try to read and comment on the last few chapters in the next few days. Happy Thanksgiving!

Best, Izzet

Is there a reason why Chapter 14 doesn't come earlier in the book? You are not using any of the BN technology or Hilbert schemes or moduli spaces. Except for 14.3.4 (which doesn't really contain a proof most students can understand in this chapter), everything is fairly elementary.

page 258, do you want a period at the end of Footnote 1?

page 258, end of 2nd paragraph, you have a partially broken reference

page 258, last full paragraph, In Prop 9.3.1 we will show, should it be we showed?

page 259, 1st line of 3rd paragraph of 14.1.1, repeated any in `any any point'

page 259, 3rd line of 5th paragraph of 14.1.1, dx/h will have -> dx/h has

page 260, statement of Theorem 14.1.1, you might want to use \left\{ and \right\}

page 261, proof of 14.1.3, L feels too much like a linear form to be the notation for a degree m form, but of course there is nothing wrong here.

page 262, line before 14.2, the reference to Eisenbud and Gray is slightly broken.

page 262, line -3, should Cartier in Cartier divisor be capitalized?

page 263, line 26, better to have \left(\right) in the pullback by the normalization

page 264, sentence before Corollary 14.2.3, Should it be `One can use' and you need a space after it.

page 265, proof of 14.2.4, line 3, should it be `there is D' linearly equivalent to D + m v^{-1}(p)'?

page 265, proof of 14.2.4, line 4, should it be v^{-1}(v(D') - mp) is linearly equivalent to D?

page 268, line 7 of 14.3, `which is in this case is', the first is should be deleted

page 268, line -3, in the statement of 14.3.1, H^0(O_C(D)) has missing)

page 269, line 4 of proof of 14.3.3, subset should be \subset

page 269, last sentence of paragraph 3 of the proof of 14.3.3, Do you need a space between . and Thus

page 271, line 5 proof of 14.3.4, missing) in v^-1(C_0 \cap L)

The level/sophistication of the proof of 14.3.4 is very different than the rest of the chapter

page 272, line 10 of example 14.3.8, will vanish -> vanishes

page 272, line 7 of example 14.3.9, which is misspelled and `a simple poles' should be `a simple pole'

page 273, end of second paragraph of 14.3.10, missing) in (g_1, ..., g_n)

page 274, Exercise 14.4.5, the reference to the section is broken

page 275, in the hint to 14.4.7, should it be as P_i runs over?