#### Open Source Textbooks and Software in Mathematics

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# A First Course in Linear Algebra



- Version 1.0, December 2006
- Over 1.5 million visitors and 2,000 daily readers at linear.pugetsound.edu
- Second result in Google search for "linear algebra textbook"
- (Hard to track actual adoptions)
- Multiple formats: print-on-demand (\$33), PDF, web EPUB version in-progress
- Worldwide audience

200 readers, 5 hours on a Friday afternoon (11 AM to 4 PM PST, Friday, March 4, 2016)



## Why Mathematics?

- Undergraduate curriculum is mature
- Topics are not controversial
- Good open source software exists (Sage, GeoGebra, WeBWorK)



# When is Enough Too Much?

Do we really need another commercial linear algebra textbook?



# When is Enough Enough?



- Contemporary Abstract Algebra Joseph A. Gallian
- 1st Edition, 1984
- 9th Edition, 2016
- Every four years, like clockwork
- List: \$198.95, Amazon:\$186.63
- Manufacturing cost:  $\leq$  \$15 (estimate)

# Does Copyright Even Make Sense Anymore?



Manufacturing and shipping controlled traditional copyright



2010 Encyclopaedia Britannica: Text is 1 GB (no images)

#### Wikipedia: $\approx$ 60x bigger

# SIMSUNG

Open Source in Mathematics

# Copyleft



- Open source work *is* copyrighted
- An author extends additional rights
  - Unlimited copying
  - Distribute modified versions
  - Viral: modified version *must* have same license
  - Can even sell modified versions
- Creative Commons License
  - CC- BY, SA, ND, NC
- GNU Free Documentation License (GFDL)

### When is Free Not Free?



- "Free to Download" (example next)
- Copyrighted source (eg LATEX), but open content (PDF)
- CC-NC, noncommercial restriction
- Gratis (gratia) vs. Libre (libere)
- An open book has its own freedom (née "intellectual property")
- A promise from an author, intent
- I will not commit to a "free to download" text

#### Bait and Switch

Linear Algebra and Applications Textbook (Thomas S. Shores, website, March 4, 2016)

In order to enable prospective users to preview my text easily and conveniently, in the past I have put a copy of it on the web for your perusal. In the last few years I've received many helpful comments and appreciative notes for having done so. I would like to thank those of you who sent me these notes and comments. You have helped me substantially improve the text. I am now under contract with Springer-Verlag and the book has been published in their Undergraduate Texts in Mathematics series in hardbound and, more recently, soft cover editions. Therefore, I have removed the on-line copy.

# Why is Open Source Better?





• Over time, fewer errors

- Rachael Chaiser, \$50 typo
- Hayden Harper, 3-hour correction
- Intellectually honest
- Integration of interactive technology
- Read on any device (no DRR)
- Remix easily (eg flash cards)
- FREE!

Rob Beezer

### Abstract Algebra: Theory and Applications

ABSTRACT ALGEBRA

Thomas W. Judson 2014 edition Othered Patholog oc

- Author: SFASU's Tom Judson
- Commercial offering, early 90's
- Released as open source February 2009
- Content replacement for Gallian
- Amazon: \$24.95
- 400 daily readers when classes are in session
- #2 result Google search "abstract algebra"
- (Hard to track actual adoptions)
- abstract.pugetsound.edu



Tom Judson's Abstract Algebra: Theory and Applications abstract.pugetsound.edu/aata

William Stein's SageMathCloud

cloud.sagemath.com

David Farmer's Collected Works

### Your Courses?



- American Institute of Mathematics Open Textbook Inititative
- Minnesota's Open Textbook Library
- LOOK before you leap
- Students: suggest to faculty
- Find authors at schools like yours
- No free desk copies
- Example: Community Calculus

### Should You Author Your Own Text?

For a typical author, obscurity is a far greater threat than piracy.

- Tim O'Reilly

- Start with "lecture notes"
- Update on whatever schedule you like
- I have not yet missed a deadline!
- Teach whatever you are writing
- Why? We write in hopes of being read

# DIY



- Good News: you can Do It Yourself
- Bad News: you will need to Do It Yourself
- Help: for authoring, MathBook XML
- Help: for copy editing, numerous readers
- Student misconceptions suggest text, exercises
- Capture classroom improvisations
- Exercises
  - Exam questions become homework exercises
  - WebWorK National Problem Library
  - Contributions from colleagues

#### http://buzzard.ups.edu/talks.html

Beezer in a Box: http://beezers.org/blog/bb

