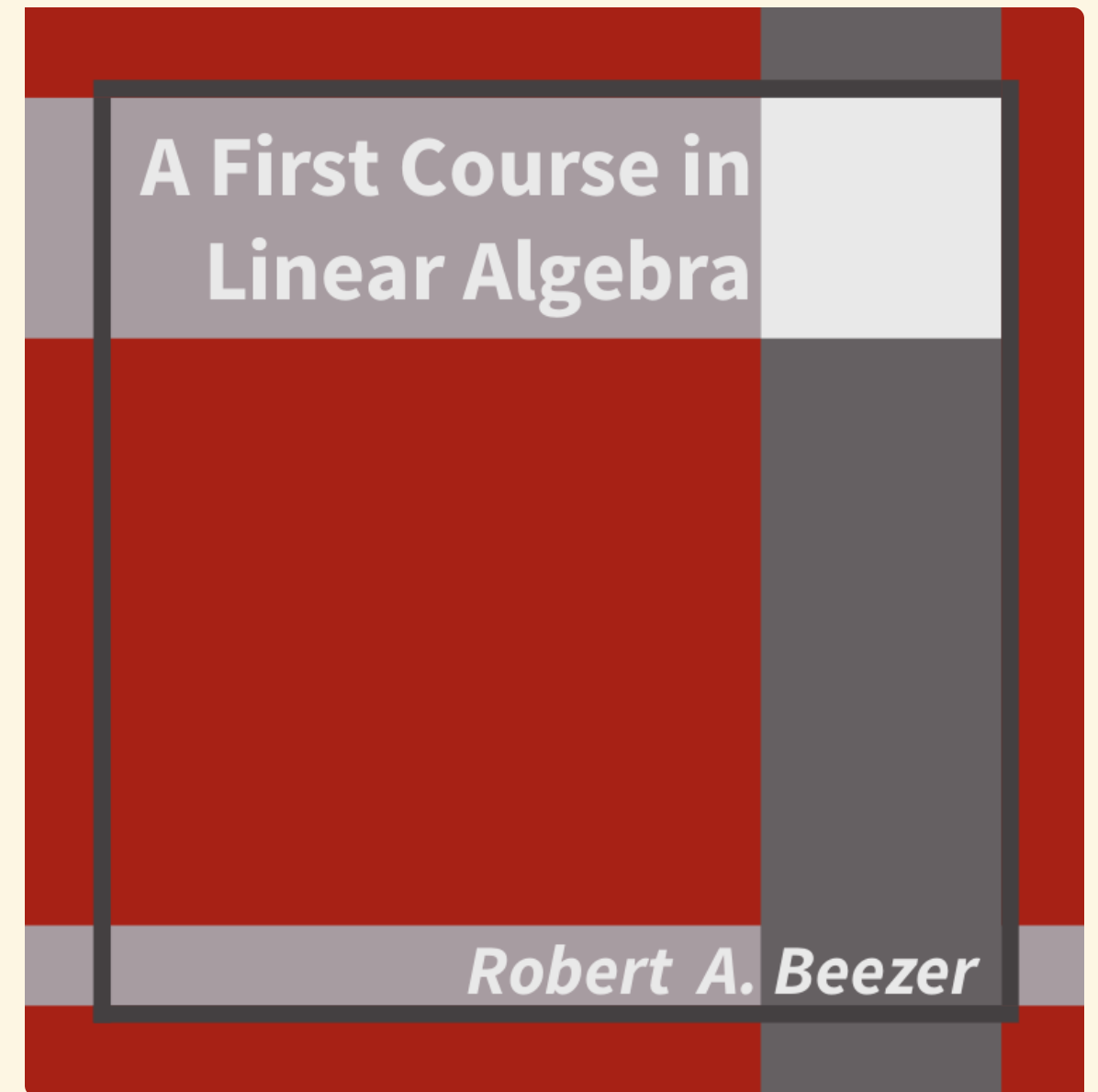# AUTHORING AND PUBLISHING WITH PRETEXT

Robert A. Beezer

University of Puget Sound

OPEN ACCESS WORKING GROUP
OBERLIN GROUP OF LIBRARIES

OCTOBER 20, 2022

HISTORY (AKA: ABOUT ME)

- 1984: Ph.D. Mathematics, U of Illinois, Urbana-Champaign
- 1984: University of Puget Sound, Mathematics Department
- 2004: "A First Course in Linear Algebra," Open License (GFDL)
- 2008: Web version, powered by jsMath (now MathJax)
- 2010–today: NSF CCLI/TUES/IUSE grants/projects
- 2013: Founded PreTeXt, with Shuttleworth Flash Grant
- 2022 (Jan 1): Retired from teaching (not from PreTeXt!)

A First Course in
Linear Algebra

Robert A. Beezer

WHAT IS PRETEXT?

- An authoring and publishing system:

  - Extensive support for mathematics (and STEM)
  - Designed to create openly licensed materials

- An abstract specification of a scholarly document
- Markup for scholarly documents (markup—"the process or result of correcting text in preparation for printing")
- All disciplines: mathematics, computer science, physics, engineering, music theory, economics, college writing, children's books, …
- Implementations of conversions to various formats
- A modern replacement for LaTeX
- A commitment to creating accessible materials
- A community of instructors, authors, and publishers
- Guided by 11 principles, e.g. …
- Principle #10: PreTeXt recognizes that scholarly documents involve the interaction of authors, publishers, scholars, curators, instructors, students, and readers, with each group having its own needs and goals.

KEY IDEA: WRITE ONCE

The PreTeXt authoring language captures an author's intent and document structure, AS THE AUTHOR WRITES.

An author concentrates on CONTENT and is not able to influence PRESENTATION.

Principle #1: PreTeXt captures the structure of textbooks and research papers.

PAYOFF: READ ANYWHERE

- PDF: print and electronic versions
- HTML: highly interactive, amazingly accessible
- EPUB/Kindle: an improvement on PDF
- Jupyter notebooks: popular for data science, Python programming
- Runestone: open-source hosting of open textbooks, with LMS, more interactivity
- Braille: embossable and electronic, 100% automated, no transcriber
- Slideshows: you are viewing one now
- Principle #3: PreTeXt documents serve as a single source which can be easily converted to multiple other formats, current and future.
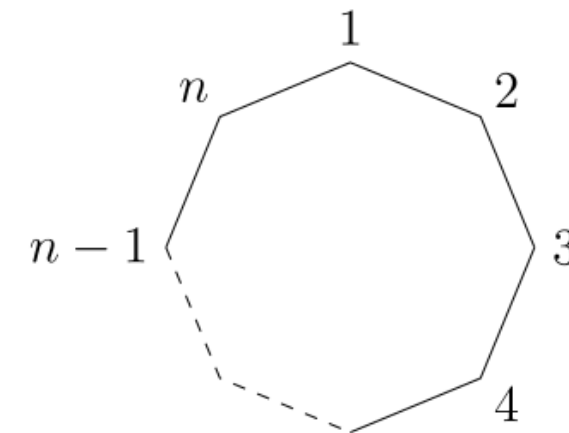
PDF, FOR PRINT AND SCREEN

- Via LaTeX, two slightly different PDFs are possible.

- Electronic is different than hardcopy print.

  - Active links, colored?
  - Color versus B/W
  - One-sided v. two-sided
  - Page size, margins

- Example: Judson's Abstract Algebra

EPUB

- A superior offline format
- On desktops or laptops
- Or on tablets or dedicated devices
- Example: Foliate reader on Linux

5.2 Dihedral Groups

Another special type of permutation group is the dihedral group. Recall the symmetry group of an equilateral triangle in Chapter 3. Such groups consist of the rigid motions of a regular n-sided polygon or n-gon. For $n = 3, 4, \ldots$ we define the **nth dihedral group** to be the group of rigid motions of a regular n-gon. We will denote this group by D_n We can number the vertices of a regular n-gon by $1, 2, \ldots, n$ (Figure 5.2.1). Notice that there are exactly n choices to replace the first vertex. If we replace the first vertex by k then the second vertex must be replaced either by vertex $k + 1$ or by vertex $k - 1$ hence, there are $2n$ possible rigid motions of the n-gon. We summarize these results in the following theorem.

Figure 5.2.1. A regular n-gon

Theorem 5.2.2. *The dihedral group, D_n is a subgroup of S_n of order $2n$*

Theorem 5.2.3. *The group D_n $n \geq 3$ consists of all products of the two elements r and s satisfying the relations*

$$r^n = 1$$
$$s^2 = 1$$
$$srs = r^{-1}.$$

Proof. The possible motions of a regular n-gon are either reflections or rotations (Figure 5.2.4). There are exactly n possible rotations:

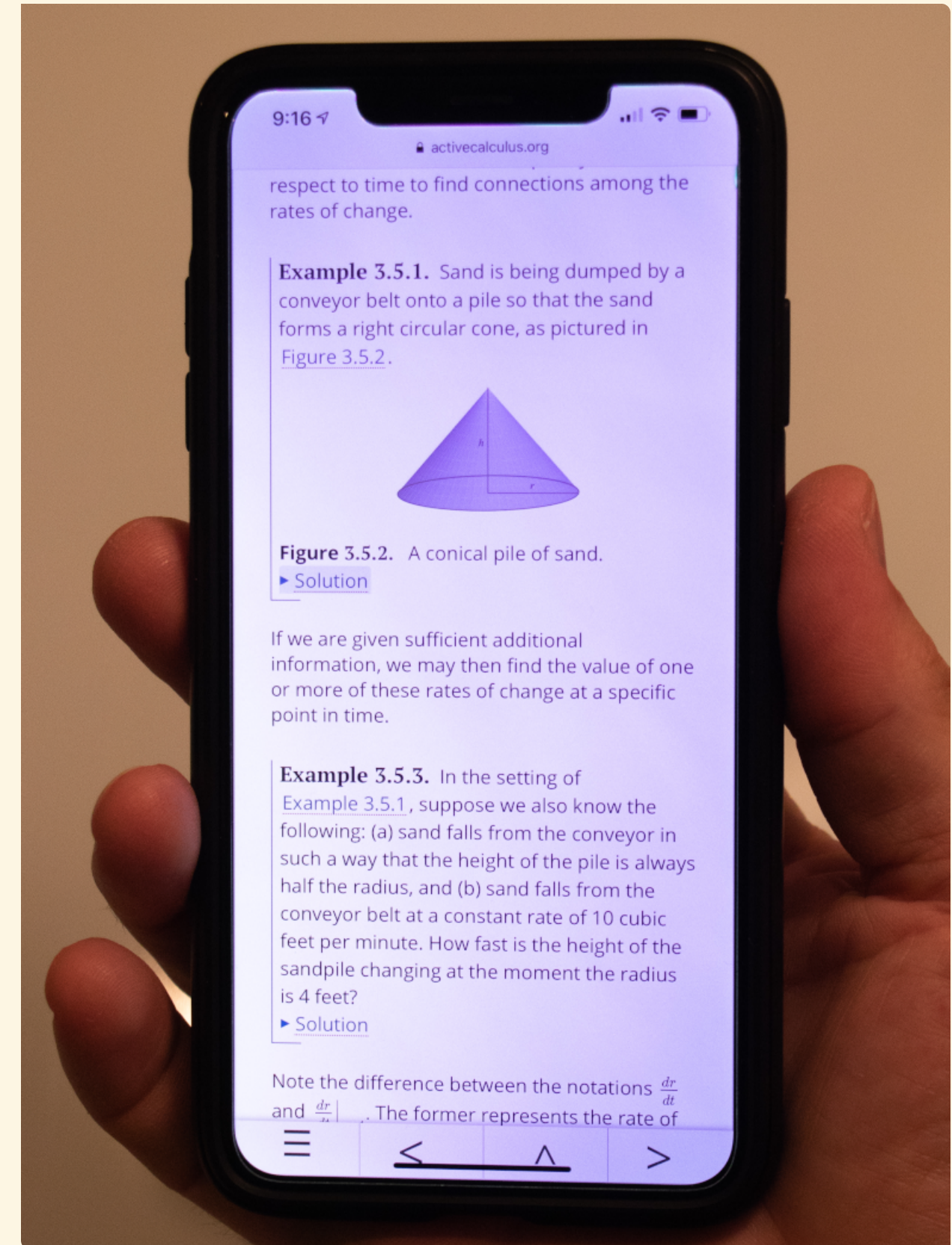$$\text{id}, \frac{360°}{n}, 2 \cdot \frac{360°}{n}, \ldots, (n-1) \cdot \frac{360°}{n}.$$

We will denote the rotation $360°/n$ by r The rotation r generates all of the other rotations. That is,

$$r^k = k \cdot \frac{360°}{n}.$$

HTML

- Everybody's favorite
- Takes advantage of HTML, CSS, Javascript
- Works well on small screens (phones)
- Accessible: works well with screen readers
- Math is powered by MathJax
- Many interactive features
- Principle #6: PreTeXt makes use of the full capabilities of the Web.

DEMONSTRATION

Judson's Abstract Algebra: Theory and Applications

`http://abstract.ups.edu/aata/aata.html`

BRAILLE

Principle #11: PreTeXt recognizes the inherent value in producing material that is accessible to everyone. (This talk could be converted to braille!)

AATA's theorem on a presentation of a dihedral group:

```
7777777777777777777777777777777777777777
,!orem  #e4ba 4
  ,! gr|p _% ,d;n _:1 _% n .1: #3 _:1
3si/s ( all products ( ! two ele;ts .2;r
& .2;s1 satisfy+ ! rela;ns
_%
r~n" .k #1
s~2" .k #1
srs  .k r~-1
_:
4
7777777777777777777777777777777777777777
```

Theorem 5.2.3. *The group D_n $n \geq 3$ consists of all products of the two elements r and s satisfying the relations*

$$r^n = 1$$
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$$srs = r^{-1}.$$

POPULARIZING OPEN EDUCATIONAL RESOURCES

- PreTeXt Goal: increase the supply of quality OER
- Assist authors to feed repositories and collections
- Lesson learned: authors need help when they become publishers
- Change begins at the "top" of the curriculum, at small schools
- How does OER compete with commercial texts?
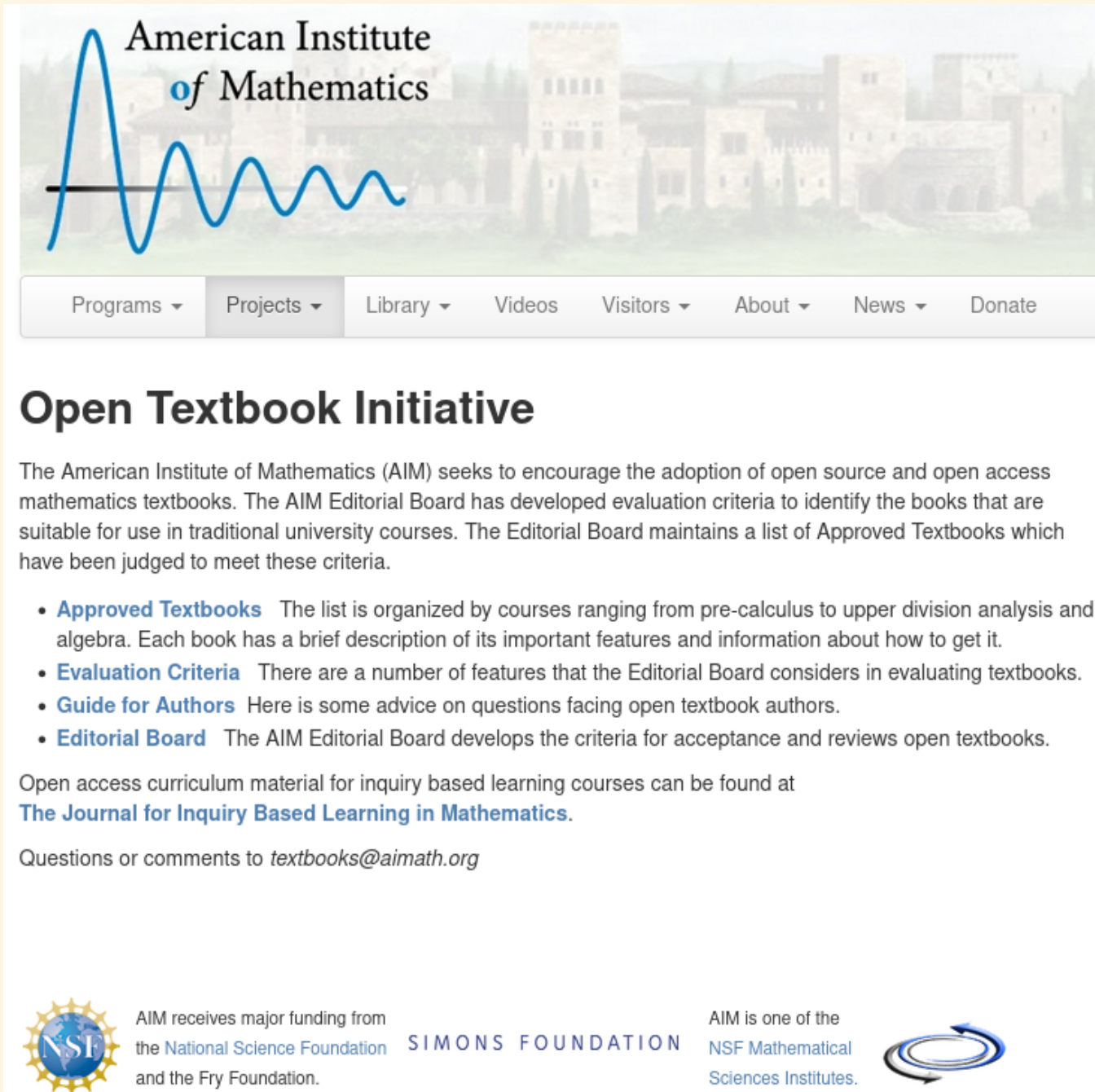- Do you really get what you pay for?

PERILS OF (SELF-)PUBLISHING

Everybody [thinks they] know what a book is…

Principle #4: PreTeXt respects the good design practices which have been developed over the past centuries.

- Which comes first, the Acknowledgements or the Foreword?
- What is a **colophon**?
- Preface v. Introduction v. Chapter Zero
- Excessive footnotes (nested!)
- Snarky footnotes
- Spaces around an em-dash (AP: half-spaces)
- Dispassoniate editing

- Print-On-Demand:

    - Services
    - Covers
    - ISBN Numbers
    - Kindle/Amazon

- We consult:

    - Chicago Manual of Style

AIM OPEN TEXTBOOK INITIATIVE

- American Institute of Mathematics: NSF-funded institute (2023: to Caltech)
- Open Textbook Initiative, directed by Kent Morrison (2023: David Austin)
- Editorial Board: approved 60 undergraduate textbooks via transparent evaluation criteria
- Editorial Board: editorial services to authors (budget-constrained)
- Website: *pointers* to the approved texts
- Website: author's guide
- A very useful *discipline-specific* project

RUNESTONE ACADEMY

Commercial texts come bundled with "homework systems" keyed to the text.

- Runestone: online (only) textbooks for computer science (only)
- Pandemic Project: very tight alliance with PreTeXt
- Runestone is free: code, content AND course hosting
- LEAP: Learning Engineering Analytics Portal
- Integrated homework and mini-LMS
- WeBWorK is a 27-year-old open source homework system for math and physics. WeBWorK is supported in PreTeXt and on Runestone. (Old and wise, showing some wrinkles.)

TODO LIST (!)

~~ToDo List~~ Action Items: how can libraries help?

- Alert mathematics and computer science authors to Runestone
- Alert STEM authors to PreTeXt: chemistry, biology, earth science
- Alert other (technically-savvy) authors to PreTeXt
- Help authors with the intricacies of (self-)publishing
- Point disipline-specific advocates to the AIM Open Textbook Initiative as a model

CONCLUSION

Principle #8: PreTeXt is free: the software is available at no cost, with an open license. The use of PreTeXt does not impose any constraints on documents prepared with the system.

Links

- `pretextbook.org`
- `runestone.academy`
- `buzzard.ups.edu/talks.html`
- Twitter: `#PreTeXtBook`, `#PreTeXtGang`

Acknowledgements

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- American Institute of Mathematics
- Partial support for this work was provided by the National Science Foundation's Improving Undergraduate STEM Education (IUSE) program under Award Nos. 1022574, 1626455, 1821706. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.