Online Resources of the Mathematical Community

Key platforms and best practices

Ana Cannas

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Mathematical Writing, ETH Zürich

Slides prepared with assistance from ChatGPT 5.

Plan for today

- Grasp the scope and best use of math sites.
  - For abstracts and reviews: **MathSciNet**, **Zentralblatt**
  - For preprints and papers: **arXiv**
  - For Q&A: **Math StackExchange**, **MathOverflow**
  - For databases: **OEIS**, **GRDB**, **LMFDB**, ...
  - Other community resources.

- Learn how to **export BibTeX** from MathSciNet (or arXiv or Zentralblatt) to build a references file for your project.

  BibTeX= LaTeX database format for bibliography – see later.

MathSciNet

What it is: AMS-curated database of math publications with reviews, journal links, MSC classification, citation links.

MSC = Mathematics Subject Classification, is an alphanumerical classification scheme used by many math journals.

Good for:

- Finding reviewed literature.
- Exploring author profiles.
- Exploring subjects.
- Chaining references (backwards and forwards).
- Exporting BibTeX for your bibliography – see demo.

Institutional access often required off-campus.

zbMATH Open

What it is: Open database with reviews, links, classification.
– Formerly known as Zentralblatt MATH.
– Edited by the EMS, the Heidelberg Academy of Sciences and Humanities and FIZ (*Fachinformationszentrum*) Karlsruhe.

Good for:

- Similar use and complementary to MathSciNet, but *open*.

Interface and bibliography export differ slightly from MathSciNet.

☞ *Reviews reflect expert judgment, but do not replace reading the paper.*

arXiv

Pronounce "archive".

What it is: Preprint (and postprint) server, moderated but

not peer-reviewed.

Good for:

- Rapid dissemination prior to journal publication.
- Latest results and version history.
- Daily alerts for preprints in subscribed categories.
- BibTEX entries – cite appropriately!
  ⟶ Look for the latest version.
  ⟶ When published, cite the journal version.

Intermezzo: BibTeX

BibTeX = a database format + tools to cite automatically

MathSciNet and other reference sites allow to export in BibTeX format.

How to use:

– Collect your references in **BibTeX format** in a `.bib` file,
for instance `myrefs.bib`.

– Put that file in your Overleaf project,
add `\bibliography{myrefs}` in your main `.tex` file,
and recompile.

Next lecture: How to cite the references in the main file.

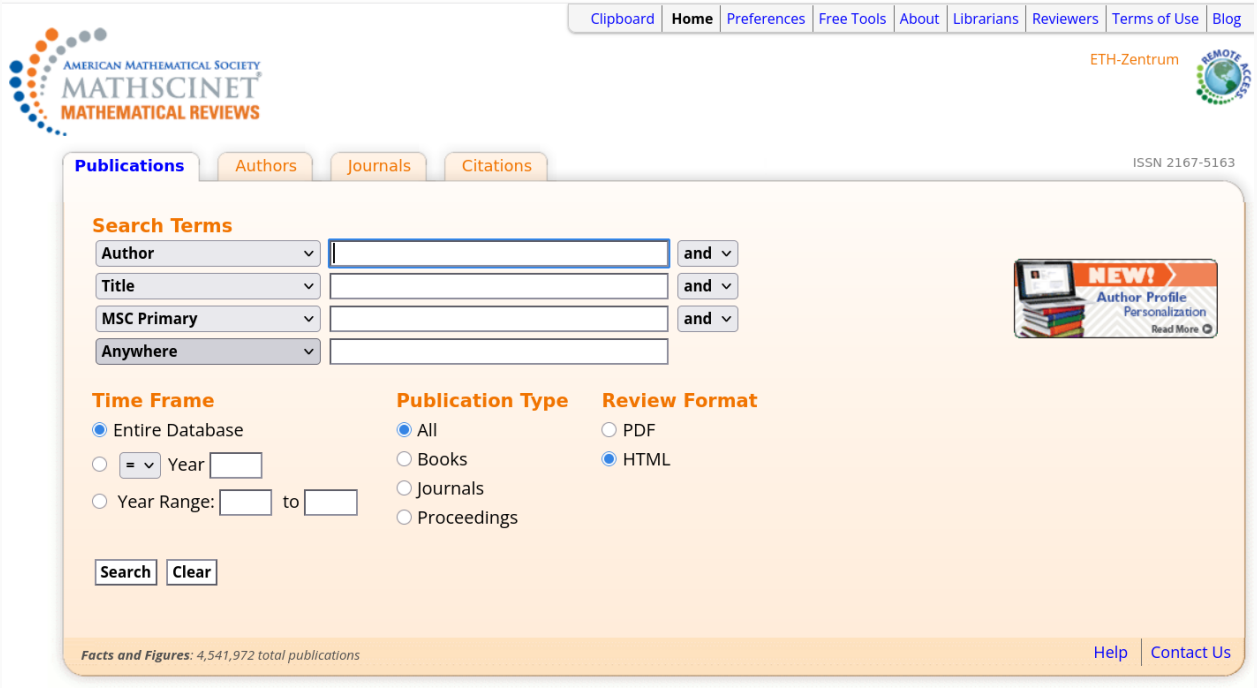
Typical BibTEXentry

```
@article {AtiyahBott,
     AUTHOR = {Atiyah, Michael F. and Bott, Raoul},
      TITLE = {The moment map and equivariant cohomology},
    JOURNAL = {Topology},
   FJOURNAL = {Topology. An International Journal of Mathematics},
     VOLUME = {23},
       YEAR = {1984},
     NUMBER = {1},
      PAGES = {1--28},
       ISSN = {0040-9383},
    MRCLASS = {58F05 (55N91 57R20 57R22)},
  MRNUMBER = {721448},
MRREVIEWER = {G.\ J.\ Heckman},
        DOI = {10.1016/0040-9383(84)90021-1},
        URL = {https://doi.org/10.1016/0040-9383(84)90021-1},
}
```

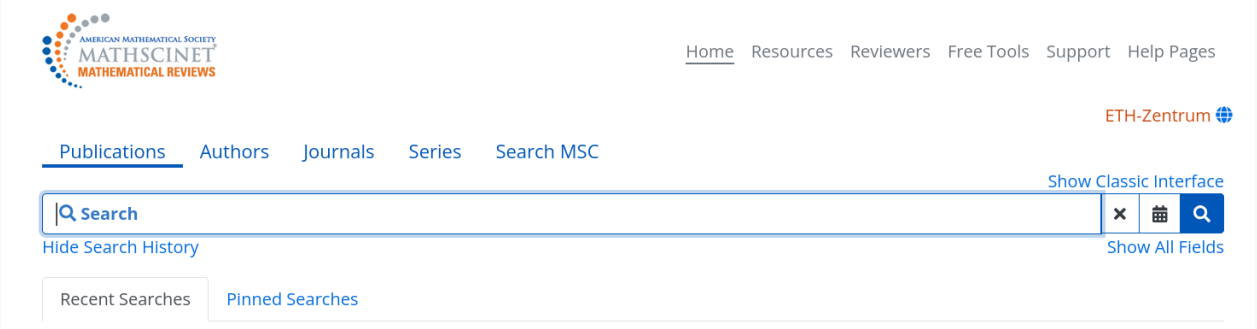
DOI = digital object identifier

Live demo: MathSciNet ⟶ Overleaf

Old release:



New release:



Math StackExchange (MSE) vs. MathOverflow (MO)

MSE: broad audience, all levels; great for teaching questions, concrete examples, LaTeX questions.

MO: research-level Q&A; appropriate for literature pointers, expert clarifications, open problems.

Etiquette:

- Search first; do not abuse.
- Use clear mathematical statements and LaTeX.
- Observe community norms.

Online databases

OEIS — Online Encyclopedia of Integer Sequences

What it is: Curated database of integer sequences with references, formulas, links.

Use to:

- Identify a mysterious sequence from first terms.
- Find literature, recurrences, generating functions.

Cite the specific OEIS entry ID, e.g., A000045 (stands for Fibonacci).

Some other online databases

LMFDB — L-Functions and Modular Forms Database

Number theory: L-functions, elliptic curves, modular forms, Galois reps, . . .

GRDB — Graded Ring Database

Algebraic geometry: Fano manifolds, graded rings, etc.

π-Base — Topology counterexamples

Topology: searchable repository of classic counterexamples.

Etc

Also open source tools – see our course website.

☞ *Check licenses and sites' "how to cite" instructions.*

People and history: Genealogy & MacTutor

Mathematics Genealogy Project:

- Track advisor/advisee lineages.
- Check thesis titles, years and institutions.

MacTutor (St Andrews):

- Find biographies and timelines.
- Contextualize citations with thematic articles.

Useful for acknowledgements, historical notes, and course enrichment.

Community good habits

- Read beyond abstracts; verify claims and hypotheses.
- Distinguish *preprint* from *published* when citing.
- When submitting reviews, be precise and constructive.
- On Q&A sites: provide minimal examples, cite sources, and follow posting guidelines.

Homework for 8/Oct – Paper 1

- Counts one point for Pass/Fail.
- Upload PDF on Moodle preferably before next lecture.
- Follow guidelines on course webpage.
- Deadline: Wedn 8/Oct 22:00, however...
- Moodle maintenance Wedn 8/Oct 18:00-20:00.
- NEW: you may use AI for a first personal revision.

Homework for 15/Oct only possible starting 9/Oct.