ENGLISH 202C

Internet Resource Guide for Mathematics Majors

Name
Name

Date

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1.1

What is in the Guide

Contained in this guide are resources relating to information on undergraduate mathematics. Because much of the material involving mathematical knowledge, both in print and online, is aimed at an above-undergraduate level, this guide takes special care to find resources that will be of particular assistance to an undergraduate audience. Some of the resources can assist in explaining new concepts or reviewing old materials. Others provide ways of assisting with homework. Still others serve as a base of information for both the professional and academic community surrounding the field of mathematics. And more provide a means for keeping abreast of current developments in the field, and allow one to do in-depth research into any one of the specific topics covered under the general category of "Mathematics".

1.2

Who this Guide is For

This guide is intended for the use of undergraduate students attending the Pennsylvania State University and majoring in or thinking of majoring in mathematics. It primarily can be used for those in search of study aids or interested in learning more about mathematics, careers in mathematical fields, the job market outlook, or research materials. This guide is useful for both freshman and seniors since it ranges from basic information to more specific and complex ideas. Also, there are sources which are beneficial for students thinking about a career in mathematics, so this guide would be well suited for seniors looking for job opportunities. Additionally, any student writing a thesis paper or doing extensive research would benefit greatly from this guide since it contains many sites which include data and references for specific mathematical fields and theories.

1.3

What this Guide Assumes

As with many things, reading this guide alone will not help you get what you need—instead, this guide merely serves as a way to "help you help yourself" by listing credible resources in a logical manner. With this in mind, the guide assumes that you have, for one reason or another, a general motivation to learn. Of course, we also assume that you have something of an interest in mathematics. This guide assumes an undergraduate-level understanding. Although several resources contained in this guide cover high-school level material, they are the exceptions. A few of the resources were included with the assumption that you are enrolled at Penn State. Also, this guide assumes that you have a reasonable familiarity with computers and the internet.

1.4

Organization of this Guide

This guide is roughly organized in a way which goes from most general to most specific. It contains four sections which describe the intent of each. It begins with the two most generally used school and professional sites under the "General Websites" section. In the "General College Statistics & Information" section, it gives data on general college statistics for mathematics. These statistics are given by national websites which can be used for in depth research as well. Next, the "Homework Help" section includes websites and databases which provide plenty of resources and explanations for extra help on homework or for studying. Lastly, for any student looking for more detailed information on specific topics, the "Research Information (Journals)" section provides abstracts on journals that could be helpful.

1.5

Tips for Using this Guide

There are a few pieces of information we feel important enough to highlight before getting into the main body of this guide. Keeping these in mind while using the guide will help you get the most out of this guide.

- Use the Table of Contents. Our material is arranged in a very specific way, and the Table of Contents helps you use that arrangement most efficiently.
- Look at the "Location" information of each entry. Certain resources are only accessible via the steps we have described in the "Location" section. Not following these steps will make the resource useless to you.
- Read the "Tips" information of each entry. Those sections contain specific, useful information to maximize each resource's usefulness. In fact, the "Tips" sections contain most of our information about actually *using* each resource.

2

General Websites

This section provides two websites that every student in the mathematical field should be familiar with. The first is a school site which gives specific information about what Penn State has to offer math students. The other site is a professional association which is great for information on careers and opportunities for math students throughout the nation.

2.1

Penn State Math Department Homepage

Website

Location and Availability
Home page: http://www.math.psu.edu/
Undergraduate Page: http://www.math.psu.edu/ug/

Description
This is the home page of Penn State's Mathematics Department. It is an online repository of departmental information for undergraduates, graduate students, and anyone else expressing an interest in mathematics at Penn State. Tabs along the side provide links to sections of the site relevant to different audiences.

In the "Undergraduate" page, the left side of the page offers links to topics which address the concerns of most undergraduate students. Since this website is the main hub of information pertaining to mathematics majors at Penn State, you will probably visit it at least once a semester, probably more.

Tips

- Consider bookmarking the "Information for Math Majors" page, contained in the "Undergraduate" section of the Math Department website. This is where most of the links to useful information for math majors is located, and you will probably be visiting this page often when planning your undergraduate schedule.
- Relatively early in your undergraduate career, you probably received a packet called the *Undergraduate Handbook*, containing various pieces of important information for math majors. You were also probably told not to lose this packet. However, if you have, you can obtain a copy of this book in PDF form from "Undergraduate Handbook" link in the aforementioned "Information for Math Majors" page.
- The "Frequently Asked Questions" section of the "Information for Math Majors" page is quite comprehensive in addressing confusing administrative nuances of the Math Department. If the *Undergraduate Handbook* is vague or confusing about whether a specific class will satisfy your graduation requirements, the odds are good that the FAQ will have the answer.

2.2

American Mathematical Society

Website

Location and Availability

http://www.ams.org

Most of the site is free. To access databases or to get "members only" opportunities, you must pay to register a membership with the organization.

Description:

The American Mathematical Society is a professional association which intends to promote mathematical research and scholarship through its programs and services. The society is made up of more than 32,000 national and international members and contains mathematical literature from the past 60 years. Programs include professional meetings and conferences, employment services, and surveys. The publications include mathematical reviews, journals, and books. The AMS is useful in helping math majors find jobs, locate links to mathematical databases such as *MathSciNet*, and keeping up-to-date on all math related headlines. There is even a section entitled "Headlines & Deadlines for Students" which includes information on achievements math students have accomplished and deadlines for various math related events for undergrads.

Tips:

- In order to access information fromm the databases provided, you must register a membership with the society.
- The tabs at the top of the home page which include "Membership," "Career Services," "Meetings," etc. are the most useful way to browse the site.

3

General College Statistics &Information

In this section, you can learn about two government sites which provide information on numerous subjects, not just college data. These sites are great for in depth research, but for the purpose of this guide, we only gave samples of information pertaining to college. These samples give great statistics and incite on some general college topics and can be beneficial in understanding the need and competitiveness of people in the mathematics field.

3.1

Catalog of U.S. Government Publications

Government Database

Location and Availability
http://catalog.gpo.gov/F?RN=58610744
Freely distributed online

Description
The *Catalog of U.S. Government Publications* (CGP) enables you to search historical and current federal publications. The CGP contains over 500,000 records dating from 1976 and will include documents from the 1800s. This site allows you to access links to online versions of publications, locate records at nearby Federal depositories, and conduct both general and specific searches. Documents in the catalog can be found by subject, title, keyword, or authoring agency. You can also find documents by year, format, or language. The CGP can be used by math majors for background research on theories or to keep up-to-date on current federal programs concerning the fields of math and science.

Tips
- Make use of the advanced search option to find specific publications.
- There are "search hints" located on the bottom of the advanced search page which can help efficiently find publications.

3.1.1

Higher Education, Science, Technology, and Mathematics Trends and the Role of Federal Programs

Sample Document

Location and Availability

http://purl.access.gpo.gov/GPO/LPS70716
Freely distributed online

Description

The testimony, "Higher Education: Science, Technology, Engineering, and Mathematics (STEM) Trends and the Role of Federal Programs" is an example of a publication you can find through the CGP. This testimony reveals findings and influential factors on trends in degree attainment and levels of employment in STEM and non-STEM fields. The document also describes federal education programs intended to support the study of and employment in STEM fields. The testimony includes statistics such as the proportion of students obtaining STEM degrees, percent increases in STEM employment, and money spent by the government on STEM related programs. This document is useful in predicting how competitive the job market will be upon graduation with a STEM degree, and the need the nation has for more STEM majors.

3.2

Statistical Abstract of the U.S.

Government Database

Location and Availability
http://www.census.gov/compendia/statab/index.html
Freely distributed online

Description
The *Statistical Abstract of the U.S* is a source of statistics for political, economic, and social associations of the United States. Both federal agencies and private organizations provide data to the site, including the Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics. This abstract contains a large quantity of statistical tables on a variety of national topics. Down the left-hand side of the homepage is a list of sections that you can choose from, clicking on any one will provide you with a table or list of data from surveys. Information provided by this site is useful because it can educate you on the status of the job market, how competitive applying to graduate schools could be, and the demand for mathematicians.

Tips
- To locate more topics than are listed on the left, click on "Subjects A to Z" at the top-right corner.
- If you have a specific topic in mind, be sure to use the search located on the right-hand side of the homepage or click "Search@Census" on the top-right corner.
- To find primary sources of statistical data, click "Guide to Sources" located under the title "Sources of Data" on the homepage.

3.2.1

College Freshmen—Summary Characteristics: 1970-2006

Sample Document

Location and Availability

http://www.census.gov/compendia/statab/tables/08s0278.pdf
Freely distributed online

Description

The "College Freshman—Summary Characteristics" table (Table 278) exemplifies a typical collection of data that appears within the *Statistical Abstract of the U.S*. This chart summarizes a collection of national averages concerning characteristics of first-time full-time freshmen in 4-year colleges and universities. This table depicts trends in the percentages of topics such as gender, area of study, political orientations, attitudes, average grades in high school, and median family incomes. This information can be used to investigate the ratio of students within the mathematics major and to decipher how completive classes and the job market will be in the future.

3.2.2

Bachelors Degrees Earned by Field: 1980-2005

Sample Document

Location and Availability

http://www.census.gov/compendia/statab/tables/08s0295.pdf
Freely distributed online

Description

The table "Bachelor's Degrees Earned by Field" (Table 295) is another example of statistics that can be found in the *Statistical Abstract of the U.S*. This table contains the national totals of people who earned a bachelor's degree in a particular field. It provides totals for the years 1980, 1990, 2000, 2003, 2004, and 2005 so you can see the trends for each major. This data is relevant in predicting the job market for mathematicians. You can see the increase in the number of grads with a math major, but the number is still low in comparison to other fields. Information like this is a good way to determine the difficulty of finding a job after graduation and to determine how well you will be paid in comparison to other fields.

4

Homework Help

This section contains resources which provide information and explanations on many mathematical subjects. These websites and database can help you answer homework questions, study for exams, and learn difficult concepts. This section is perfect if you have a professor who is hard to understand or you just need a little more help with an idea.

4.1

PhysicsForums

Website

Location and Availability
Home Page: http://www.physicsforums.com/
Online forum, free registration.

Description
PhysicsForums is a discussion group dedicated to all subjects math and physics related. It is free to register an account, and anyone without an account is free to browse the forum. The website's main function is homework assistance. There are strict rules in place, however, against posting full solutions to another poster's homework question.

Tips

- If you wish to post a new question, or reply to a question posted by someone else, you must register an account.

4.2

Math World

Website

Location and Availability

http://mathworld.wolfram.com
Free to use

Description

MathWorld is an extensive mathematical resource which contains detailed explanations of concepts and ideas. It includes a compilation of information from the past decade and continues to be updated daily. The left-hand column of the screen provides a list of general topics such as "Algebra," "Calculus," and "Geometry" which, when clicked, leads you to lists of subtopics. From there, clicking on any subtopic will bring you to columns of problems, theories, and strategies. This site is a great resource for studying and completing homework. It can help you learn difficult topics that you may be struggling with or simply satisfy your curiosity for various mathematical ideas.

Tips

- Using the search function is the most efficient way to navigate the site.
- If you are unsure about what you are looking for, then clicking on any topic listed in the left-hand column and browsing the titles will lead you to your answer.

4.3

S.O.S. Mathematics

Website

Location and Availability
Home page: http://www.sosmath.com/
Free to use

Description
S.O.S. Mathematics is a free website that features comprehensive review materials. Despite its dated appearance, the website is kept up-to-date by several math Ph.D's. The website is laid out like a textbook, with the main page linking to the major topics covered. The topic pages themselves are laid out like a table of contents, with each subheading serving as a link to a specific page. In short, the navigation is intuitive and will quickly get you where you need to go. There are 6 main topics covered in the website, none of which are beyond the typical sophomore level. The website also offers online practice exams, reachable through the "CyberExams" link on the main page. There are also message boards, but they are not as active as the *PhysicsForum* boards

5

Research Information

This section is most beneficial to anyone who is in need of specific information for research or for a thesis. There are three sites which provide journals that include detailed content about authors, theories, publications, etc. This section is for more advanced math students because the writing is more technical and detail oriented. These sites can also be used for background information on mathematician or theorems in the case of writing biographies or analyses.

5.1

MathSciNet

Electronic Database

Location and Availability

http://www.ams.org/mathscinet/
Free through the Penn State Library

- Go to www.psu.edu
- Click on "libraries" then "libraries home"
- Click on "Databases By Title"
- Click on "MathSciNet" and enter your Penn State id and password

Description

MathSciNet is a database for locating mathematical related reviews, abstracts, and bibliographic information. This site contains more than 2 million items and over 700,000 direct links to original documents. On the homepage, you can search by publications, authors, journals, author citations, and journal citations. There are tabs on the top-right corner of the home page that include a "free tools" tab. Clicking on this tab brings you to another set of search options including: search mathematical subject classification (MSC), collaboration distance, current journals, and current publications. The *MathSciNet* database is an asset when writing papers on mathematicians, investigating theories, or keeping abreast of new discoveries or ideas in mathematical fields.

Tips

- Explanations of all the search options can be found by clicking on the "about" tab located at the top-right corner of the homepage.

5.2

Project Euclid

Electronic Database

Location and Availability
http://www/projecteuclid.org/
Database is free, certain journals within are not.

Description
Project Euclid is an electronic index of mathematical journals, run by the Cornell University Library. The database indexes professional society journals and smaller, more "independent" journals, mostly. It is a small database, with only 54 journals indexed. *Project Euclid*'s small size, however, is not entirely bad, as one can easily browse through its collection of journals manually. The website itself is visually appealing, and the navigational scheme is intuitive. The search engine is well designed and user-friendly. Along with having the standard author, title and subject search fields, it allows users to specify specific phrases to look for in both the abstract and the full text of articles. Overall, the main advantages of *Project Euclid* are its robust search engine, convenient Browse feature, and attractive design. The main drawback is its small size.

Tips

- The "Browse" page allows you to sort the list of journals by discipline, as well as by name.
- The right edge of the search screen offers "Quick Tips." Use them! They explain the nuances of the search engine, and can make your searches more effective while preventing you from getting frustrated.
- Some journals indexed by *Project Euclid* are free. Some are subscription-only. Some are in-between. The listing of all the journals indexed by *Project Euclid* color-codes this information with colored boxes.
- There is a search bar at the top of every page, but clicking on the "Search" tab brings you to a much more advanced set of search features.

5.3

The College Mathematics Journal

Professional Journal

Location and Availability

Free through the Penn State Library.

- Go to University Libraries Home
- Click on "Research Guides by Subject"
- Select the "Mathematics Subject Guide"
- Click on link to *MathSciNet*
- Search for "The College Mathematics Journal".

Description

The College Mathematics Journal is a bimonthly publication of the Mathematics Association of America. It is a resource for both students and teachers, and it focuses on subjects likely to be covered during the first two years of an undergraduate mathematics curriculum. Contained in the journal are reviews, problems with solutions, and a variety of articles covering a wide range of topics. The articles range from reviews of specific mathematical concepts, to explanations of common conceptual errors students make, to surveys of undergraduate mathematics courses and curricula. Every issue features a section entitled "Classroom Capsules", which provides instructors with suggested resources, methodologies, and illustrative examples to aid in the teaching process. Each issue ends with a set of problems and corresponding solutions.

Tips

- Make sure to access the journal through the Penn State Library system.
- The "Classroom Capsules" section is an excellent resource if you are struggling to understand a concept and want another way of approaching it.

5.4

Rose-Hulman Undergraduate Mathematics Journal

Professional Journal

Location and Availability

http://www.rose-hulman.edu/mathjournal/index.php
Freely distributed online.

Description

The Undergraduate Mathematics Journal is a biannual journal dedicated to publishing papers written entirely by undergraduate students. It is a freely-distributed publication from the Rose-Hulman Institute of Technology. The journal exists in only electronic format, but the archive of old issues is freely searchable, and articles are free to download in PDF format. Whereas most other mathematics journals are written for a graduate or postdoctoral audience, the *Undergraduate Mathematics Journal* is wholly at an undergraduate comprehension level. Necessarily, the journal cannot be peer-reviewed. The journal instead maintains its integrity and rigor requiring that submissions be accompanied by a letter from a professor acting as the student's sponsor. The journal does not require that results of submissions be novel or original.