MATHEMATICS ON THE INTERNET

A STUDENT'S GUIDE 1999

ANDREW T. STULL

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DEDICATION

This new edition is dedicated to my son, Nicholas. At only nine months of age, he has taught me patience, given me tremendous joy, and opened my mind to a new vision of the world. I look forward to every new day of discovery with him. I can only imagine what challenges and wonders the world will offer him when it's his time to walk.

This new edition would not have been possible without the continued love, encouragement, and support of my wife, Elizabeth. She is my inspiration for attempting to highlight the Internet as a tool for teaching and learning. I continue to be inspired by her inexhaustible energy and amazed by her skill for teaching and love for learning. Finally, I would like to thank everyone at Prentice Hall for allowing me to explore the role of technology in the classroom.

Andrew T. Stull

PREFACE
CHANGE!

I finished the first edition of this manual at 7:22 p.m. on July 23, 1995, and the second edition at 2:04 p.m. on January 31, 1997. You might think it odd that I should mention the time—but think again. At an earlier time in our history, information took months or years to cross continents and oceans. At that time, any news less than a month old was "late breaking." The accuracy of news today is obviously measured differently, now taking seconds for information to circle the globe. In fact, the popularity of the Internet has created a situation where individuals hear about important news events before the newspapers have a chance to even print them in the papers. The world has changed and continues to change! Our world is louder, faster, and more complex than the ones experienced by earlier generations, but it also offers more promise. In terms of information transfer, we might be described as a techno-generation; our parents, as a paper-generation. Dealing with change is a basic requirement for surviving in our modern world. But fear not, our on-line future might be chaotic but it should also be exciting. Prepare yourself to revel in this change.

This manual has four chapters. In the Introduction, *One Step Ahead*, I will briefly describe basic techniques and tools that you should already be familiar with. I will not, however, go into detail on many aspects that were covered in the first two editions of the *Student's Internet Guide*. There are many resources available to help beginners and novices; therefore, another beginning guide would be a waste of paper. I will gladly point you to a plethora of information to help you get started. What I hope this resource will do is help you begin using the Internet as a tool—a tool for communicating; a tool for optimizing your workload; and a tool for navigating the jungle of information available to you. Yes, you may still choose to use the Internet as a toy, and I'll even show you a few places to start, but that won't generally help you face the information challenges ahead of you.

In Chapter 1, *Finding Your Way*, you will review techniques for gleaning information from the Web. The Internet is viewed by many as a time sink and a channel for misinformation. Within this chapter you will learn about searching for, evaluating the merit of, and properly citing information. Learning to use the Internet judiciously will be a distinct asset.

In Chapter 2, *News of The Day*, you will explore ways to use the Internet to stay in touch with the news of the world and scientific happenings. The Internet, as a new media for communication, includes news sources from television, radio, newspapers, and magazines.

In Chapter 3, *Staying in Touch*, you will learn how to employ simple resources, such as e-

mail, homepages, and calendars, for managing your time and organizing your busy schedule. The Internet was initially and is primarily a communications tool. Whether it be direct communication, such as with electronic mail (e-mail), or passive communication, such as with Web pages, the Internet is becoming the most prominent way for you to gather and disseminate information to the world.

In Chapter 4, *Staying in Tune*, you will learn about the tools provided for you to companion your textbook. As the digital revolution progresses, the definition of a book will change. In addition to the chapter resources found within the paper version of your textbook, there are many chapter resources found within its digital Web companion.

Throughout this guide, you will find a collection of basic and advanced resources to help you make the most of your study of science and your study of life on the Internet.

Reading this manual won't teach you all there is to know about the Internet, but it will help you to teach yourself. In the future, you will need to find information for yourself rather than rely solely on others, who may bear outdated knowledge. If you are successful, your skills in "harvesting" information from the Internet will allow you to deal with perpetual change. By the end of this manual, you should be comfortable and resourceful in navigating the complexity of the Internet, from its back eddies to its thriving thoroughfares.

INTRODUCTION
ONE STEP AHEAD

This thing that we now call the Internet has been evolving ever since it was first developed almost thirty years ago. Its prominence in our society has been increasing exponentially in recent years. It is unlikely that you are reading this manual without some basic understanding of the Internet and its features. Furthermore, I'm pretty confident that most of you have considerable knowledge of the Internet. While earlier editions of this guide were written with no expectation of your Internet experience, this is no longer a realistic position. Numerous "Internet guides" are available to help the beginner connect to and browse the Internet. This third edition of my Internet guide will take the next logical step and attempt to help you make the most out of the Internet as a tool and not simply as a toy. Let me justify this with a bit of history. At one point in time, telephones came with an instruction manual. This was a time when telephones were still new, and a telephone number was just a confusing string of numbers. Today, if you see a phone number you know what it is and how to use it. Can you imagine how funny it would be to have someone think that an explanation was needed on how to use a telephone or how to interpret a telephone number? The Internet might not be as integrated in our culture as the phone system, but it will be and not too far in the future. For a majority of you, a string of characters such as *http://www.something.com* already has meaning. Don't worry, if you're not yet this familiar with the Internet, I'm not going to leave you in the dust, but you will need to do some homework. The Web sites listed below will point you to many helpful resources about the online world. You'll be Web surfing in no time.

The Internet was born as the solution to a problem. It was designed to provide a global communication channel for the exchange of scientific information and research. Gradually, however, the Internet has also become a digital post office, a digital bulletin board, a digital telephone, and a digital tutor. Depending on whom you listen to, it may eventually be a digital television, a digital textbook, or even a digital classroom. The bottom line is that the Internet is growing in as many directions as people realize its potential and employ its power to solve their problems. But don't get too far ahead; its real merit to you is how it will solve <u>your</u> problems and make <u>your</u> day just a bit more manageable. Hopefully, that is what you'll discover here.

For those of you with a driving quest for knowledge, here are a couple of Web addresses discuss the history, growth, and culture of the Internet. In addition, I've included several basic tutorials to help you refresh your knowledge and fill in the gaps you might have about browsing, bookmarking, and connecting to the Internet.

History

History can be a valuable tool if you wish to understand the nature of things. Often, history can be used to predict the future. If you ever wanted to know why the Internet came into existence, how it has changed since its birth, or where it might go, then the following resources are the last stop you'll need to make.

BBN Timeline
http://www.bbn.com/customer_connection/timeline.htm

The BBN Timeline places important events about the Internet in context with other historical events and throws in plenty of social commentary to give you perspective.

Hobbes' Internet Timeline
http://info.isoc.org/guest/zakon/Internet/History/HIT.html

This site offers a great deal about the Internet, the people who use it, and online culture.

Getting Started

The following URL's are a few of the many beginner guides available on the Internet. You'll find everything you need to know about modems, browsers, e-mail, bulletin boards, chat rooms, and getting connected to the Internet on at least one of these sites.

An Introduction to the Internet from Interactive Connections
http://icactive.com/guide/index.htm

This is a very comprehensive guide to the Internet. It is provided by Interactive Connections, an Internet Presence Provider.

Learn the Net
http://www.learnthenet.com/english/index.html

Learn the Net specializes in online training products and services for the corporate world. Their guide is well written and up-to-date.

Net Guide from PC User Magazine
http://www.pcuser.com.au/netguide/

This guide is sponsored by the Australian version of PC User Magazine.

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CHAPTER 1
FINDING YOUR WAY

Many of you reading this guide have a lot of experience with computers, while others have little or none. Before proceeding, you should have and be familiar with a few basic resources:

1. computer
2. Web browser
3. Internet connection

Don't worry if you can't afford your own. It is not my goal to spend your money. There are many free or dirt-cheap options available to you, and I'll do my best to show them to you. At an earlier time, I would not have made these assumptions, but computer labs and their use are now a common and even required component of a science curriculum. Furthermore, I'm pretty confident that these computers have one of the popular browsers by Netscape or Microsoft and an Internet connection. If you haven't found your campus computer lab yet, then my guess is that you'll find it associated with your campus library. From a beginner's point of view, the only real concern you'll have is learning the basics.

SECTION 1.1
SEARCHING THE WORLD

Although, many wire-heads consider the Internet to be the largest library on the planet, it doesn't necessarily have the easiest card catalog in the world. In this section, we'll explore techniques of searching the Internet for your gain, discuss practices for evaluating the validity of content you find, and review guidelines for citing information within your class assignments. With practice, these skills will help you improve your usage of the Internet.

There is one skill, or rather behavior, that you must adopt in order to maximize your time-to-gain ratio. That is, be aware of "search drift." The Internet is an information jungle, and if you wander into it without having a sound idea of why you are there or if you just wander around without being aware of where you are, then you will get lost and waste a great deal of time. Yes, there are times when you will want to play, wander, and have a good time, but consider whether that is important when you are trying to study the night before a test.

SEARCHING

Yahoo! is a good place to begin. It is only one of many resources available on the Internet. I didn't name it, and I don't know how it was named, but it is easy to remember. Here is the URL for *Yahoo*!:

http://www.yahoo.com/

Yahoo! began as a simple listing of information by category—kind of like a card catalog. In recent years, it has added the ability to search for specific information. At the top level of the directory, there are several very general categories, but as you move deeper into the directory, you'll notice that the categories become more specific. To find information, you simply choose the most appropriate category at the top level and continue through each successive level until you find what you're looking for (or until you realize you're in the wrong place). Don't be afraid to experiment—it's easy to get lost but also easy to find your way home.

Suppose you are shopping for a graphing calculator to purchase for your math course, and you want to look at all of the models available. Within *Yahoo*!, notice that "Calculator" is not one of the "top-level" categories; you must "estimate" where "Calculator" might be placed. Probably the best choice is "Computers and Internet", since a calculator is really just a mini-computer. After accessing the "Computers and Internet" category, you'll notice that it gives a list of many different types of "Computers and Internet" subcategories - still no "Calculators" listed - once again you must try to guess which subcategory is appropriate. Of all of the choices, "Hardware" is probably the best choice, since a graphing calculator is a piece of electronic hardware. After accessing the "Hardware" subcategory, you finally see a "Calculators" subcategory. Because *Yahoo*! cross-references among the categories, you'll find that several related categories will lead you to your desired page.

Much of your success in finding information with this type of tool really centers around your preparation for the search. Often, it is possible to find information on a topic in a category that may at first seem unrelated to your topic of interest. Again, let's take the example of shopping for a graphing calculator. Although you may consider this a Computer topic, there are other avenues to consider. Aren't graphing calculators primarily used in education? Categories related to education could be searched. Aren't graphing calculators used primarily in Science? By selecting the Science or Education categories, and then further selecting into appropriate subtopics, you might also turn up something related to graphing calculators.

Prepare yourself for a search before you jump into one. In the long run, it will save you both time and frustration. Don't be afraid to try some strange approaches in your search

strategy. A good technique is to pull out your thesaurus and look up other names for the word. You might be able to find a more common form of the word. Think of everything associated with your question and give each of these subjects a try. You never know what might turn up a gold mine.

The following list of resources contain many more helpful tips and techniques for searching the Internet.

Internet Search Tips and Strategies from Southern California College
http://www.sccu.edu/R-Harris/howlook.htm

Searching the Net from PC Magazine
http://www.zdnet.com/pcmag/features/websearch/_open.htm

Using Internet and Web Search Engines Effectively: An Online Course from the American Library Association
http://www.ala.org/ICONN/advancedcourses.html

SEARCH ENGINES

A more direct approach to finding information on the Web is to use a *search engine*, which is a program that runs a search while you wait for the results. Many search engines can be found on the Web. Some of Web search engines are commercial and may charge you a fee to run a search. Search engines are also available for other parts of the Internet: *Archie, Veronica*, and *Jughead* are examples of such search engines.

As mentioned earlier, *Yahoo*! also has a useful search engine. A search engine that I use frequently is called *Lycos* (*http://www.lycos.com*). It's simple to operate but, as with any search tool, it takes practice and patience to master. Take the time now to connect to *Lycos*, and we'll take it for a test run. When you first see the opening page, you'll notice that it is very complex. But it's an excellent resource, and the instructions on the page will tell you almost everything you need to know. To search, enter a word into the white text entry box and press the submit button. *Lycos* will refer back to its database of information and return a page of hyperlinked resources containing the word you entered. When the query results come back to you, notice that they are hyperlinks to various sites on the Internet.

To see how a search engine works, use *calculator* as a topic for a search. Notice that you can set the number of responses that the engine will return to you. Did you notice that some of your results didn't seem to apply to your topic? This is one of the pitfalls of search engines. They are very fast, but they don't think—that is your job. A search using the term *calculator* is just as likely to turn up a link to Financial Loan Calculators, not quite what we were looking for. To perform an effective search, you will need to spend

time before the search preparing a search strategy. When you do research using an automated tool like a search engine, you can expect many links to be unrelated to your topic of interest—but all in all, search engines are still very powerful tools.

Another type of search service that you'll hear much about is called a meta-search service. This type of service will send your query out to a number of different search engines and then tabulate the results for you. They come in many different levels of sophistication and they also generate a large amount of information. If you're not intimidated by volume then give one of them a try.

Here's one that I just learned about and one that is actually fun to use. Give it a try.

Ask Jeeves **http://www.askjeeves.com/**

One last word on search engines. These tools don't directly search the Internet. They actually search a database that is derived from the Internet. Here is how it works. Search engines use robots (automated programming tools) that search for and categorize information. This information is placed into a database. It is this database that you search when you use the search engine. Can you think of a potential problem with this system? Unfortunately, the quality of the database depends on the effectiveness of the robot that assembles the database. This is why you should not rely on just one search engine tool. Use several, because what one does not find, another might.

The following resourses will help you learn more about searching the Internet.

How To Search the Web from Palomar College
http://daphne.palomar.edu/TGSEARCH/

Search Engine Tutorials from Mercklermedia
http://searchenginewatch.com/resources/tutorials.html

Search Engine Watch from Mercklermedia
http://searchenginewatch.com/

World Wide Web Research Tools from Southern California College
http://www.sccu.edu/faculty/R-Harris/search.html

SECTION 1.2
BEING A LITTLE PICKY

In your career as a student and eventually as a professional, you will spend a great deal of time using the Internet to communicate and find information. But, can you trust the information you find? In traditional publications, just as with Internet publications, there are

strong, reliable sources of information and then there is the other end of the spectrum. Is it possible to leave a grocery store without passing a tabloid newspaper displaying a title like "Elvis Was A Spy for a Race of Alien Invaders?" It's obvious that this title is misleading as we all know that Elvis was actually a double agent and on our side. When information is outlandish, it is easy to spot the truth from the lie, but not everything is as obvious. Misinformation is occasionally passed on by respected publications as well. Do you remember CNN's 1998 retraction of an erroneous report saying that US soldiers used the nerve gas sarin in a Vietnam-era mission? The truth was uncovered but not before it was passed to the world. Yes, the system is often self-correcting, but this takes time. Many people in our society view "first and incorrect" as being more important than "second and correct." With the speed and ease with which we can "publish" information on the Internet, there is little time for the system to identify its own mistakes. Developing skills to evaluate all sources of information intelligently, especially those from the Internet, will be a valuable asset.

Evaluating the merit and accuracy of an information source isn't new to the Internet. Criteria for evaluating content has been around ever since it was possible to pass information from one person to another. The informal criteria that have evolved through time have simply been adapted to reflect each advance in our ability to communicate. Criteria for evaluating the Internet have been adapted from the previous standards to reflect the unique challenges offered by the speed and global nature of the Internet.

The following is a list of criteria that I use to evaluate information sources. They are adapted from traditional evaluation criteria and personal observations of the behavior of Internet authors, managers, and publishers. Additionally, there are many Internet sites that discuss evaluating information from the Internet. You may eventually develop additional criteria by which you evaluate Internet sources, but these should get you started:

1. Authority
- Who is the author?
- What are the author's credentials or affiliations?
- Is contact information listed for the author?
- Does the source cite respectable references?

2. Accuracy
- Does the piece follow basic spelling, grammar, and composition rules?
- Does the information appear to be reliable?
- Are the embedded hyperlinks valid?
- Do the hyperlinked or referenced sources present accurate information?
- Does the author accept feedback and error notices?

3. Objectivity
- How is the source biased?
- Does the author have an agenda?
- What is the purpose or intent of the piece?
- Is the piece intended to be persuasive?

4. Currency

When was the original piece created?
Is the piece updated on a regular basis?
Does the piece incorporate recent events and information?

5. Coverage

Who is the intended audience?
How comprehensive is the piece?
Does the author present the depth as well as the breadth of the topic?
Is the content of the piece original, an interpretation, or a reference work?

6. Stability

Does a student, an instructor, or an institution author the piece?
Is the URL likely to change over time?
What is the domain and URL of the posted piece?
What is the primary focus of the organization behind the sponsoring domain?
Is the piece part of a managed and maintained Web site?
Does the site have an identifiable site administrator?
How long has the piece been resident at the current URL?

7. Utility

Is the piece valuable as a source of primary information for a topic?
Is the piece valuable as a source of reference information for a topic?
Does the piece effectively use visual media and graphic enhancements?
Is the piece a reference tool such as a bibliography or link library?
Is the piece a service tool such as a dictionary, glossary, or search engine?
Is the piece a communication tools such as a newsgroup or chat room?

Of course, my list of criteria is not the last word on the topic. If you wish to review criteria that others have proposed for evaluating Internet resources, look through these sites. Each will offer you a unique point of view but all are valuable sources of information that I encourage you to read.

Evaluating Quality of the Net from Babson College
http://www.tiac.net/users/hope/findqual.html

Evaluating Internet Resources: A checklist from University of California, Berkeley
http://infopeople.berkeley.edu:8000/bkmk/select.html

Evaluating World Wide Web Information from The Libraries of Purdue University
http://thorplus.lib.purdue.edu/library_info/instruction/gs175/3gs175/evaluation.html

Ten C's for Evaluating Internet Resources from University of Wisconsin-Eau Claire
http://www.uwec.edu/Admin/Library/10cs.html

Teaching Students to Think Critically about Internet Resources from University of Washington
http://weber.u.washington.edu/~libr560/NETEVAL/index.html

Thinking Critically about World Wide Web Resources from University of California, Los Angeles
http://www.library.ucla.edu/libraries/college/instruct/web/critical.htm

SECTION 1.3
LISTING WHAT YOU FOUND

The next logical step after you've found and evaluated your sources of information is to correctly cite them in your work. Just as everything else in math and science, citing references requires a specific format. A natural part of all math and science reports is a citation list supporting the background, design, and conclusions of the described research. Different math and science disciplines and journals will have different formats but in general there is a common design by which math and science references are cited. For example, the Council of Biological Editors has a standard style for cited references. As we've seen with the other topics included in this chapter, the traditional way of doing something often needs to be modified to include on-line content. It is a simple matter of properly citing on-line references so I will not go into it here. A number of print and on-line reference works are available to help you. Additionally, many journals will have their own format for listing on-line references. To reiterate what I wrote in the section on evaluating content, it is important to properly evaluate your references so that they have merit as a cited work.

The following list of URL's are sources to help you learn the proper way to cite on-line references.

Citing Electronic Information Sources from the University of Washington
http://weber.u.washington.edu/~libr560/NETEVAL/citing.html

Electronic Style from The University of Tennessee, Knoxville
http://funnelweb.utcc.utk.edu/~hoemann/whats.html

Online! A Reference Guide to Using Internet Sources from St. Martin's Press
http://www.smpcollege.com/online-4styles~help

CHAPTER 2
NEWS OF THE DAY

The Internet is proving itself to be a fast means of distributing news to the world. Even before the news agencies have a chance to convert news into ink and paper, it is available to you on the Internet. Your problem now is not one of news access but one of news volume. Mathematics is the language of technical and business news. A greater understanding of mathematics will allow you to excel in gaining important financial, scientific, and data-oriented news, using the Internet to make this knowledge acquisition almost instantaneous.

In this section of the chapter, we'll explore a few of the many sources of general and science news on the Internet, and you'll see how easy it can be to surf the Internet without being buried by the information wave.

SECTION 2.1
A SMORGASBORD

Mathematics is an everyday tool that we use to communicate quantifiable information. While much of the news - politics, government, events, human interest - is relayed with pictures and words, other portions of the news dealing with scientific, economic, and financial matters are almost purely relayed in mathematical language.

One major news story that always grabs the headline is a change in bank interest rates. Why? If you own a house, a car, or have loans from a bank for other items you have purchased, your bank charges you interest on these loans, usually on a monthly or yearly basis. If interest rates - which are set by the government in an attempt to control the general health of the economy - are set to be lower, there is a good chance that your existing or future loans will have less interest charged to them, meaning you get to keep more money. If bank interest rates are raised, you might rethink purchasing that new car just yet.

Rarely are these headlines very informative, except in the larger picture. "Interest Rates Lowered" is a typical headline that almost always lacks any mathematical information. By using the internet, you can research this story to find out answers to the following questions:

- How much lower did the interest rates go than their previous level?
- What is the current loan percentage rate at various banks?