

# Using wikis to enhance collaboration

Dana C. Ernst

Spotlight on Faculty Using Technology - 2010



What is a wiki?



# What is a wiki?

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## Plymouth State University

From Wikipedia, the free encyclopedia Coordinates: 43°45′32″N 71°41′21″W﻿ / ﻿43.75889°N 71.68917°W﻿ / 43.75889; -71.68917

**Plymouth State University**, formerly **Plymouth State College**, is a regional comprehensive university located in **Plymouth, New Hampshire** and part of the **University System of New Hampshire**.

Plymouth State University is a coeducational, residential university with an enrollment of approximately 4,300 undergraduate students and 2,262 graduate students. The school was founded as Plymouth **Normal School** in 1871. Since that time it has evolved to a Teachers College, a State College, and finally to a State University in 2003.

It was founded as a teacher's college, and it still retains a distinguished teaching program/major to this day. Since that time however, it has diversified its academic profile, adding many new majors and fields of study. The school has become known in recent years for its **meteorology** program (**Judd Gregg** Meteorology Institute), which is considered one of the best in the eastern United States, and is also strong in business, visual and performing arts, interdisciplinary studies, and psychology.

Also, new majors such as Criminal Justice have been added and other programs have increased their stature, especially the natural sciences with the creation of The Center for the Environment. The university now offers a total of nineteen academic departments, with nearly forty different options within the major programs.

### Plymouth State University



**Motto** Ut Prosim (*That I May Serve*)

**Established** 1871

**Type** Public

**President** Dr Sara Jayne Steen

**Provost** Dr Julie N. Bernier

**Undergraduates** 4,300

**Postgraduates** 2,262

**Location** Plymouth, New Hampshire, United States

**Campus** Rural

**Colors** Green & White

**Nickname** PSU

**Mascot** Panther

**Website** <http://www.plymouth.edu/>



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- A wiki is a website that allows the easy creation and editing of any number of interlinked web pages via a web browser using a simplified markup language or WYSIWYG text editor



The screenshot shows a Wikipedia article for Plymouth State University. At the top, there are navigation tabs for 'article', 'discussion', 'edit this page', and 'history'. The article title is 'Plymouth State University' with a coordinate link. Below the title, it states 'From Wikipedia, the free encyclopedia'. The main text describes the university's history, from its founding as Plymouth Normal School in 1871 to its evolution into a State University in 2003. It mentions the university's enrollment of approximately 4,300 undergraduate students and 2,262 graduate students. A sidebar on the right contains a table of key facts about the university, including its motto, establishment date, type, president, provost, and website. The left sidebar contains navigation and search options.

**Plymouth State University**  
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The screenshot shows a Wikipedia article for Plymouth State University. The page includes a navigation sidebar on the left with links like 'Main page', 'Contents', and 'Featured content'. The main content area features the university's name, a brief history, and a detailed infobox on the right. The infobox contains the university's motto, establishment date, type, president, provost, enrollment numbers, location, campus, colors, nickname, mascot, and website.

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- The very first wiki was WikiWikiWeb, which was used for computer programmers to collaborate and communicate



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- "Wiki" is Hawaiian for "quick"



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- Revision control



What was my motivation for  
using a wiki?



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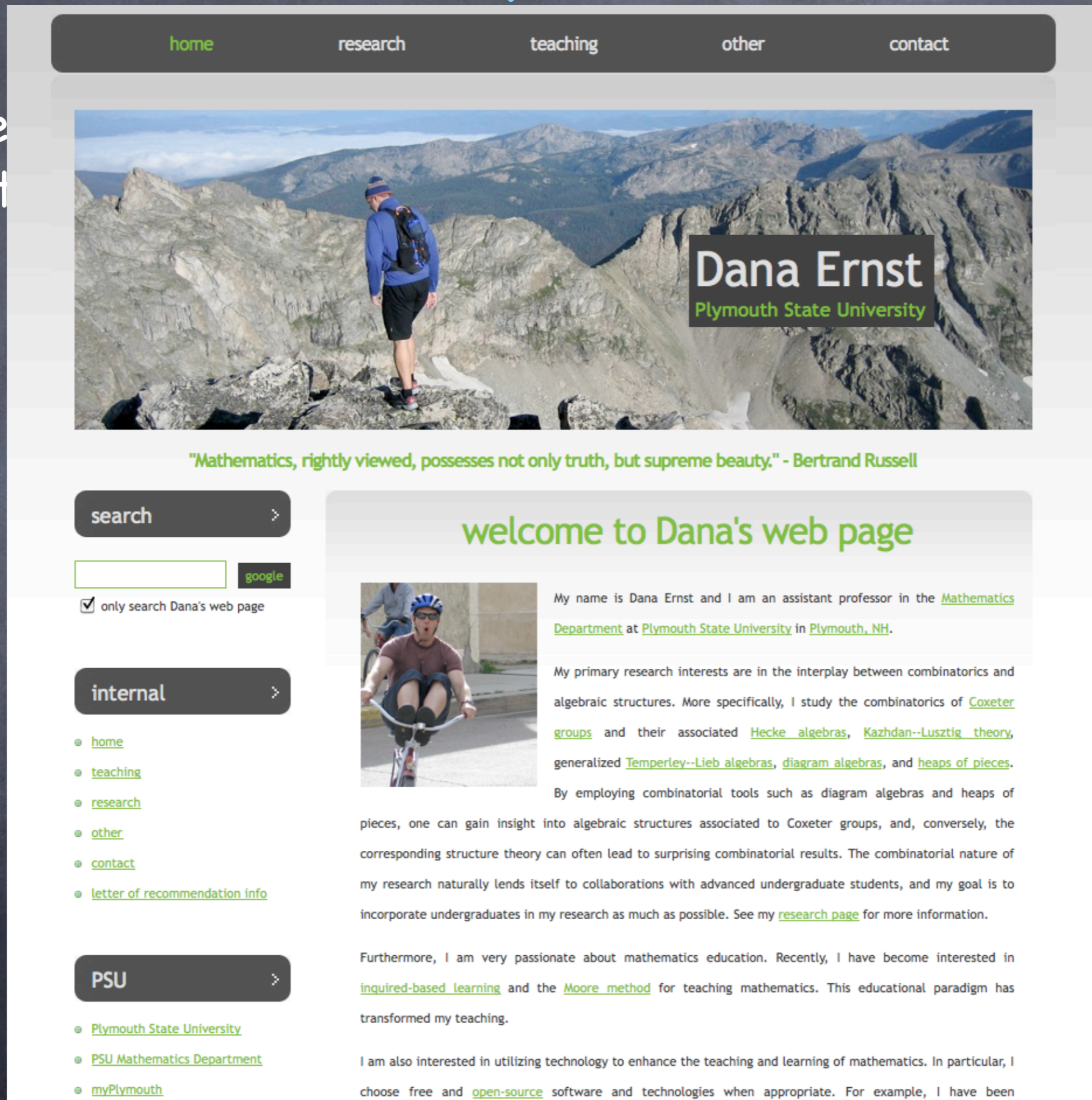
- I have been making my own web pages for several years, but I wanted something more interactive



# What was my motivation for

I have  
I want

ears, but



The image shows a screenshot of a personal website for Dana Ernst. At the top is a navigation bar with links for 'home', 'research', 'teaching', 'other', and 'contact'. Below this is a large photograph of a person hiking on a rocky mountain trail. A text box overlaid on the photo reads 'Dana Ernst' and 'Plymouth State University'. Underneath the photo is a quote: '"Mathematics, rightly viewed, possesses not only truth, but supreme beauty." - Bertrand Russell'. The main content area is divided into two columns. The left column contains a search bar with a 'google' button and a checkbox for 'only search Dana's web page'. Below the search bar is an 'internal' navigation menu with links to 'home', 'teaching', 'research', 'other', 'contact', and 'letter of recommendation info'. At the bottom of the left column is a 'PSU' menu with links to 'Plymouth State University', 'PSU Mathematics Department', and 'myPlymouth'. The right column features a 'welcome to Dana's web page' heading, a small photo of Dana Ernst on a bicycle, and several paragraphs of text. The text introduces her as an assistant professor in the Mathematics Department at Plymouth State University and describes her research interests in combinatorics and algebraic structures, specifically mentioning Coxeter groups, Hecke algebras, Kazhdan-Lusztig theory, Temperley-Lieb algebras, diagram algebras, and heaps of pieces. She also discusses her passion for mathematics education and her interest in inquired-based learning and the Moore method. Finally, she mentions her interest in using technology to enhance teaching and learning, particularly free and open-source software.



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# What was my motivation for using a wiki?

wiki site-name .wikidot.com Share on Edit History Tags Source Explore » Dana Ernst | My account ▾

## Algebraic Structures (Spring 2010)

Plymouth State University

course information help user profiles admin stuff Search this site Search

### Algebraic Structures

#### welcome

Welcome to the course wiki for the Spring 2010 manifestation of MA4140: Algebraic Structures at [Plymouth State University](#). This wiki is viewable by anyone, but content can only be added and edited by authorized users, which basically means students registered in the class.

In the [Web2.0](#) world, more and more of reading, writing, and communicating mathematics occurs online. A major component of the course will be the course wiki at <http://ma4140.wikidot.com>, which will provide an opportunity for you (as students) to collaborate together, and for [me](#) (the instructor) to provide feedback visible to all.

What is a wiki, you ask? According to [Wikipedia](#), the world's largest wiki site:

A *Wiki* (['wi.ki] <wee-kee> or ['wi.ki] <wick-ey>) is a type of website that allows users to add, remove, or otherwise edit and change most content very quickly and easily.<sup>[1]</sup>

As a part of the [Wikidot.com](#) network, this site is a customizable piece of the internet where users can edit content, upload files, communicate and collaborate.

During the semester, you will use the wiki to:

1. Ask [questions](#) of [your Professor](#) and fellow students and post responses to these questions.
2. Collaboratively post content to [chapter summaries](#) consisting of definitions, theorems, and standard examples for use on the in-class portion of exams.
3. Post [group projects](#).

Part of your grade will be based on your participation in the online wiki. I will be able to see what contributions you have made to the site, and grade you accordingly. For more information, see the [course syllabus](#).

#### getting started

During the first week of classes, I will send you an invite to join the wiki. To join, you will need to sign up for a free [Wikidot](#) account. *Please use your real name when signing up.* (As a Wikidot member, you can create your own free wiki or web page.) Once you are signed up, your first task is to create a user profile. For more information, go [here](#).

#### what is this course all about?

This course is an introduction to abstract algebra. Abstract algebra is the subject area of [mathematics](#) that studies [algebraic structures](#), such as [groups](#), [rings](#), [fields](#), [modules](#), [vector spaces](#), and [algebras](#) [2]. For more information, see the Wikipedia article located [here](#). We will spend most of our time studying groups, but we will have an opportunity to explore additional topics in your [group projects](#). We will take an axiomatic approach (definition, theorem, and proof) to the subject, but along the way, you will develop intuition about the objects of abstract algebra, pick up more proof-writing skills, and skills that enable you to better read, understand, and communicate mathematics. We will also discuss how the field of abstract algebra fits into the broader "picture" of mathematics and take a look at some applications. The emphasis of this course is on your ability to *read*, *understand*, and *communicate* mathematics in the context of abstract algebra.

course information

- [syllabus](#)
- [schedule](#)
- [homework](#)
- [Sage labs](#)
- [course notes](#)
- [chapter summaries](#)
- [exams](#)
- [partner list](#)
- [group project](#)
- [textbook](#)

#### help

- [forum](#)
- [recent forum posts](#)
- [useful tips](#)
- [how do I typeset mathematics?](#)
- [Sage help](#)
- [Wikidot quick reference](#)
- [contact the instructor](#)

add a new page

[edit](#) [source](#) [print](#)

but



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- Ease of use, flexibility, & total control




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## Algebraic Structures (Spring 2010)



Plymouth State University

Dana Ernst | [My account](#)



[course information](#) [help](#) [user profiles](#) [admin stuff](#)

### forum categories


**general discussion**  
A place to ask questions about homework or to share insight.

Category name	Threads	Posts	Last post
<b>help!</b> Need help with a particular homework problem or looking for a hint? Post a question here.	31	127	by  Dana Ernst (5 hours ago) <a href="#">Jump!</a>
<b>announcements</b> General announcements will be posted here.	18	46	by  Dana Ernst (1 day ago) <a href="#">Jump!</a>

**technical questions**  
A place to discuss the nuts and bolts of interacting with the wiki, typesetting mathematics, etc.

Category name	Threads	Posts	Last post
<b>wiki stuff</b> Do you have a technical question about the wiki? Post questions and comments here.	4	21	by  Shaun Gil (31 days ago) <a href="#">Jump!</a>
<b>typesetting mathematics</b> Post questions about typesetting mathematics and LaTeX here.	4	8	by  Dana Ernst (32 days ago) <a href="#">Jump!</a>

[Show hidden](#)

 [RSS: New threads](#) | [New posts](#)

Page tags: [forum](#)

page\_revision: 1, last\_edited: 30 Jan 2010, 15:48 -0-500 (55 days ago)  
[Stop watching site ma4140.wikidot.com](#) [?]

[Edit](#) [Tags](#) [History](#) [Files](#) [Print](#) [Site tools](#) [+ Options](#)

[Help](#) | [Terms of Service](#) | [Privacy](#) | [Report a bug](#) | [Flag as objectionable](#)

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# What was my motivation for

## Re: Ex 2.24

[Fold](#)


 Dana Ernst 27 Feb 2010, 13:57 -0-500

What does  $(aba^{-1})^n$  mean? What does  $a^n b^n a^{-n}$  mean? What would have to be true in order for both of the expressions to be equal? Does the order matter? (I think you can guess what I am hinting the answer to your question is.)

[Reply](#) | [Options](#)

## Re: Ex 2.24

[Fold](#)

 Cathy Ajamie 27 Feb 2010, 14:54 -0-500

I guess, according to Thm 2.8, those expressions are equal only if the group is abelian, which I can't assume.

On the other hand, according to this theorem,  $(g^m)^n = g^{mn}$ . So, what's the deal? I have to assume  $(g \cdot h)^n \neq g^n h^n$ , right? The exponent laws as I know them don't work anymore?


I feel like Prop. 2.4 could be useful here,  $(ab)^{-1} = b^{-1}a^{-1}$ .

Cathy Fulkerson Ajamie

[Options](#)

## Re: Ex 2.24

[Fold](#)

 Dana Ernst 27 Feb 2010, 15:10 -0-500

On the other hand, according to this theorem,  $(g^m)^n = g^{mn}$ . So, what's the deal?

The deal is that an element always commutes with itself. There's only  $g$  here!

I have to assume  $(g \cdot h)^n \neq g^n h^n$ , right?

I think it would be more accurate to say that you cannot assume anything one way or the other.

The exponent laws as I know them don't work anymore?

I was trying to jump up and down in class when I was trying to make this point. Some of the exponent laws that you are familiar with for real numbers are the way they are *precisely* because  $\mathbb{R}$  is abelian. By definition, we have

$$(gh)^n = \underbrace{(gh)(gh) \cdots (gh)}_{n \text{ copies}} \tag{1}$$

And on the other hand, we have

$$g^n h^n = \underbrace{gg \cdots g}_{n \text{ copies}} \underbrace{hh \cdots h}_{n \text{ copies}} \tag{2}$$

The only way these two expressions can be equal is if we can commute  $g$  and  $h$ .



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## SAge lab 2

 [Melissa Whittemore](#) 2 Mar 2010, 16:39 -0-500 [Fold](#)

is anyone certain of what question 4 means?  
(4) Which elements commute with every other element?

[Reply](#) | [Options](#)

## Re: Sage lab 2

 [Dana Ernst](#) 2 Mar 2010, 16:45 -0-500 [Fold](#)

Melissa & everyone else,

If an element, say  $a \in G$ , commutes with every other element, then this means  $ax = xa$  for all  $x \in G$ . It's like being abelian, but you're only checking whether an individual element commutes with everything else. If the group is already abelian, then ALL the elements commutes with all the other elements. However, in a nonabelian group, some elements may still commute with every other element. Look at the group table and see if there are any rows that are identical to the corresponding column. Do you see why this is checking what I'm asking? Maybe the answer is "none." There is always *at least one* element that commutes with everything.

I hope that helps.

[Reply](#) | [Options](#)


## Re: Sage lab 2

 [mattjpalermo](#) 3 Mar 2010, 13:04 -0-500 [Fold](#)

that actually did help. thanks dana

[Options](#)


## Re: Sage lab 2

 [Melissa Whittemore](#) 4 Mar 2010, 12:37 -0-500 [Fold](#)

thanks Dana we were lost at that question.

[Reply](#) | [Options](#)


## Re: SAge lab 2

 [Shaun Gil](#) 3 Mar 2010, 22:49 -0-500 [Fold](#)

I don't know if I was sleeping in class or what but how do we know when to either add or multiply in a cayley table? This is making me have a difficult time trying to interpret the cayley table for  $H$  in the sage lab.

[Reply](#) | [Options](#)

## Re: SAge lab 2

 [Dana Ernst](#) 4 Mar 2010, 07:18 -0-500 [Fold](#)

Shaun, the answer is that it doesn't matter what the operation is. The table tells you how to combine any two elements of the group regardless of the operation. Since I alluded to what each of these groups is, you can figure out what the operation is, but you do not need that information to answer any of the questions. You can get everything that you need from the table.

By the way, the  $x_0, x_1$ , etc notation is short for  $x_0, x_1$ , etc.



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- Expose students to Web 2.0 technology



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- Open content with the ability to control editing privileges
- Expose students to Web 2.0 technology
- Be able to keep track of editing history



compare versions

rev.	flags	actions	by	date	comments
32.	<input type="radio"/> <input checked="" type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	:-) <a href="#">Christin V</a>	9 Mar 2010	
31.	<input checked="" type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	:-) <a href="#">Christin V</a>	9 Mar 2010	
30.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">Dana Ernst</a>	9 Mar 2010	
29.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">jakeross125</a>	9 Mar 2010	
28.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	:-) <a href="#">Jordan Libby</a>	8 Mar 2010	
27.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">jakeross125</a>	4 Mar 2010	
26.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">jakeross125</a>	4 Mar 2010	
25.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">Sarah Otis</a>	4 Mar 2010	
24.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">jakeross125</a>	4 Mar 2010	
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19.	<input type="radio"/> <input type="radio"/>	<u>S</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">Dana Ernst</a>	22 Feb 2010	
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2.	<input type="radio"/> <input type="radio"/>	<u>M</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">Dana Ernst</a>	4 Feb 2010	Parent page set to: "course-info:summaries".
1.	<input type="radio"/> <input type="radio"/>	<u>V</u> <input type="checkbox"/> <input type="checkbox"/>	<a href="#">Dana Ernst</a>	4 Feb 2010	Added tags: summaries.
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- Improve students' ability to communicate mathematics
- Provide a "gentle" introduction to LaTeX

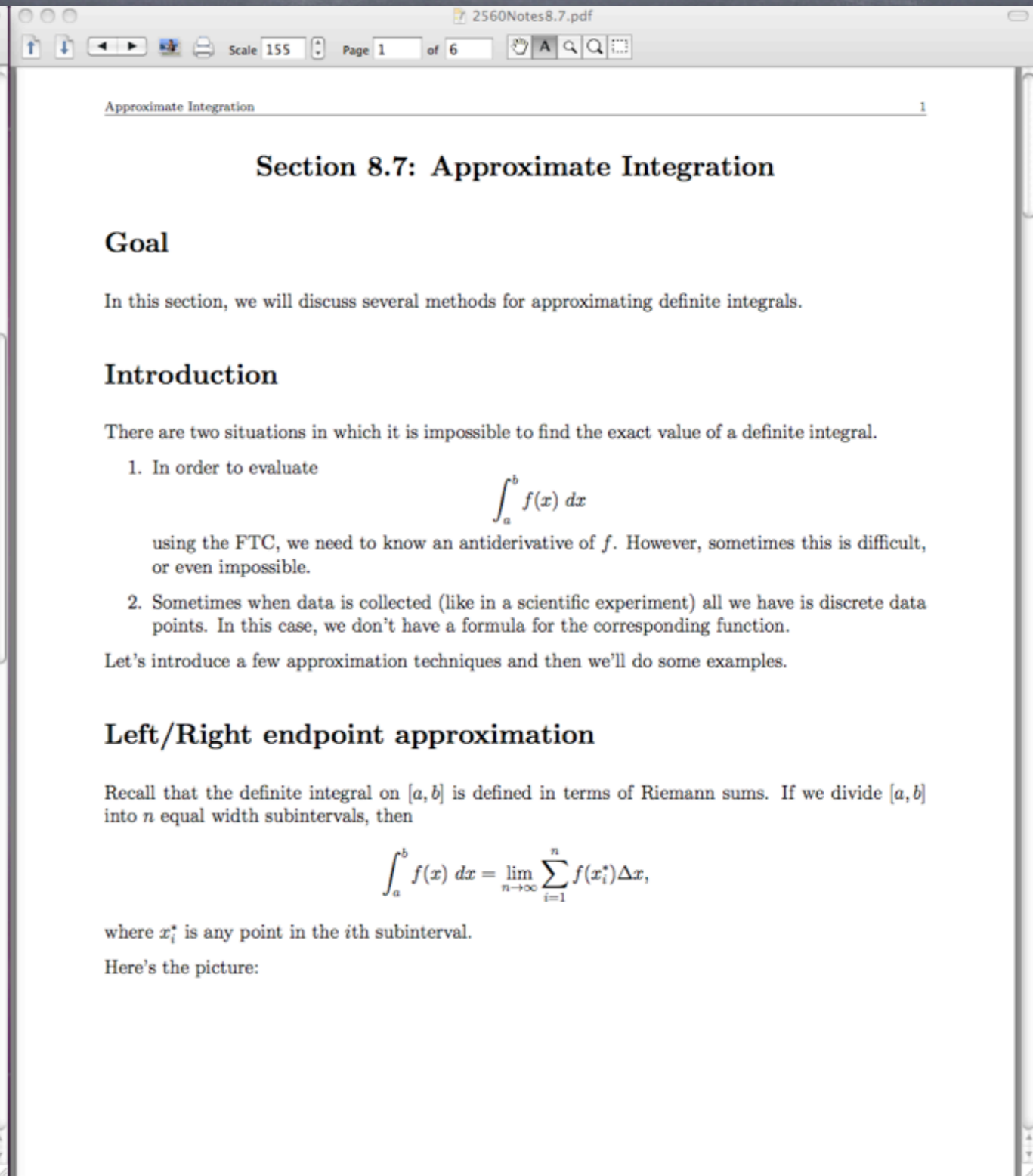


# What was my motivation for

```
2560Notes8.7.tex
Typeset LaTeX Macros AutoComplete
60 \thead{\scriptsize Approximate Integration}
61 \thead{}
62 \thead{\scriptsize \the page}
63 \tfoot{\scriptsize This work is licensed under the \href{http://creativecommons.org/licenses/by-sa/3.0/us/}{Creative Commons Attribution-Share Alike 3.0 License}.}
64 \tfoot{}
65 \tfoot{\scriptsize Written by \href{http://oz.plymouth.edu/~dcernst/}{D.C. Ernst}}
66 \renewcommand{\headrulewidth}{0.4pt}
67 \renewcommand{\footrulewidth}{0.4pt}
68
69 \begin{document}
70
71 \begin{center}
72 {\Large\bf Section 8.7: Approximate Integration}
73 \end{center}
74
75 \section*{Goal}
76 In this section, we will discuss several methods for approximating definite integrals.
77
78 \section*{Introduction}
79 There are two situations in which it is impossible to find the exact value of a definite integral.
80
81 \begin{enumerate}
82
83 \item In order to evaluate
84 
$$\int_a^b f(x) dx$$

85 using the FTC, we need to know an antiderivative of  $f$ . However, sometimes this is difficult, or even impossible.
86
87 \item Sometimes when data is collected (like in a scientific experiment) all we have is discrete data points. In this case, we don't have a formula for the
88 corresponding function.
89 \end{enumerate}
90
91 Let's introduce a few approximation techniques and then we'll do some examples.
92
93 \section*{Left/Right endpoint approximation}
94
95 Recall that the definite integral on  $[a,b]$  is defined in terms of Riemann sums. If we divide  $[a,b]$  into  $n$  equal width subintervals, then
96 
$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i^*) \Delta x$$

97 where  $x_i^*$  is any point in the  $i$ th subinterval.
98
99 Here's the picture:
100
101 \fill
102
103 \newpage
104
105 If we take  $x_{i-1}^*$  to be the left endpoint of the subinterval, then  $x_{i-1}^* = x_{i-1}$ . In this case, we can approximate the integral using
106 \begin{center}
107 \begin{tikzpicture}
108 \draw [red] (0,0) -- (1,0);
109 \end{tikzpicture}
110 \end{center}
111
112 Similarly, if we take  $x_i^*$  to be the right endpoint of the subinterval, then  $x_i^* = x_i$ . In this case, we can approximate the integral using
113 \begin{center}
114 \begin{tikzpicture}
115 \draw [red] (0,0) -- (1,0);
116 \end{tikzpicture}
117 \end{center}
118
119 \section*{Midpoint rule}
120 If we take  $x_i^*$  to be the midpoint of the subinterval, then  $x_i^* = \frac{1}{2}(x_{i-1} + x_i)$ . In this case, we can approximate the integral using
121 \begin{center}
122 \begin{tikzpicture}
123 \draw [red] (0,0) -- (1,0);
124 \end{tikzpicture}
125 \end{center}
126
127 \section*{Trapezoid rule}
128
129 There's no reason why we have to use rectangles to approximate. Instead, let's approximate the shape of the function using straight line segments and
130 approximate the area under the curve using the corresponding trapezoids.
131
132 Here's the picture:
133
134 \fill
```



Provide a 'gentle' introduction to LaTeX



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## Proposition 2.5

Let  $G$  be a group. For any  $a \in G$ ,  $(a^{-1})^{-1} = a$ .

## Proposition 2.6

Let  $G$  be a group and  $(a, b) \in G$ , then  $ax = b$  and  $xa = b$  have unique solutions in  $G$ .

## Proposition 2.7 Cancellation Law for Groups

If  $G$  is a group and  $a, b \in G$  then  $ba = ca$  or  $ab = ac$  implies  $b = c$ .

## Theorem 2.8

If  $G$  is a group and  $g \in G$ , then we define  $g^0 = e$ . For  $n \in \mathbb{N}$ , we define

$$g^n = \underbrace{gg \cdots g}_{n \text{ times}} \quad (1)$$

In a group, the usual laws of exponents hold; that is, for all  $g, h \in G$ ,

1.  $g^m g^n = g^{m+n}$  for all  $m, n \in \mathbb{Z}$ ;
2.  $(g^m)^n = g^{mn}$  for all  $m, n \in \mathbb{Z}$ ;
3.  $(gh)^n = (h^{-1}g^{-1})^{-n}$  for all  $n \in \mathbb{Z}$ . Furthermore, if  $G$  is abelian, then  $(gh)^n = g^n h^n$ .

## Proposition 2.9

A subset  $H$  of  $G$  is a subgroup iff it satisfies the following conditions:

1. The identity  $e$  of  $G$  is in  $H$ .
2. If  $h_1, h_2 \in H$ , then  $h_1 h_2 \in H$ .
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# What was my motivation for

## Edit the page

Title of the page:

H1 **B** *I* U ~~S~~ `tt`  $X^y$   $X_y$  **R**  
— **DIV** **toc** | | | `code` `code`  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

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Help: [wiki text quick reference](#) | [code snippets collection](#)

Short description of changes:

Max 200 characters (200 left)

You have an exclusive 15-minute lock that will stop others editing this page while you are working. The lock expires in **783** seconds of inactivity.

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- Improve students' ability to communicate mathematics
- Provide a "gentle" introduction to LaTeX
- Cut down on individualized emails!



How am I using the wiki?



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- Make announcements specific to the course (reminders about due dates, any changes to homework, etc.)
- Make general announcements (mathematics seminars, scholarships, interesting nuggets of information, etc.)



How are my students using the wiki?








# How are my students using the wiki?

- Required to create a profile page



# How are my students using the wiki?

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## Algebraic Structures (Spring 2010)

Plymouth State University

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[Dana Ernst](#) | [My account](#)

### course information

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- [schedule](#)
- [homework](#)
- [Sage labs](#)
- [course notes](#)
- [chapter summaries](#)
- [exams](#)
- [partner list](#)
- [group project](#)
- [textbook](#)

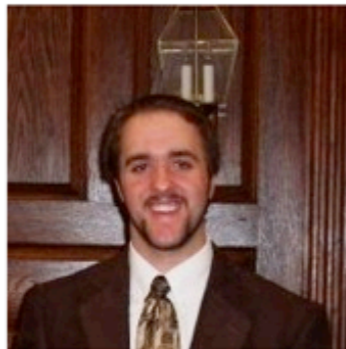
### help

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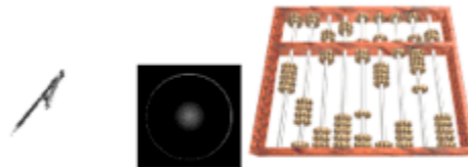
## Jacob Ross



From: Barre VT

Major: BS Mathematics secondary cert. option. I have known since the 7th grade that I wanted to be a math teacher. Algebra caught my attention at a young age and we have had a wonderful relationship ever since.

Career: High school mathematics teacher



### Favorite Quotations:

"In fact, if I had to design a mechanism for the express purpose of destroying a child's natural curiosity and love of pattern-making, I couldn't possibly do as good a job as is currently being done— I simply wouldn't have the imagination to come up with the kind of senseless, soul-crushing ideas that constitute contemporary mathematics education." Paul Lockhart

"It's fun to do the impossible" Walt Disney

"anything is possible" KG

"If you wanna be the best you got to train harder then the rest" radio ron

"If music be the food of love, play on,  
Give me excess of it; that surfeiting,  
The appetite may sicken, and so die." Shakespeare

"flexibility is the key to total fitness" Radio Ron

"I have told you these things, so that in me you may have peace. In this world you will have trouble. But take heart! I have overcome the world." John 16:33

### Contact Info:

Email: [jwross@plymouth.edu](mailto:jwross@plymouth.edu)

Number: 802 839-9383

AIM: jakeross125

Mailing address: 19 Highland Ave/suite 3520 Plymouth, NH 03264

### Links:

<http://www.plymouth.edu/math/resources/center.html>

<http://www.teachertube.com/>

<http://www.facebook.com/group.php?gid=2204911489>



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# How are my students using the wiki?

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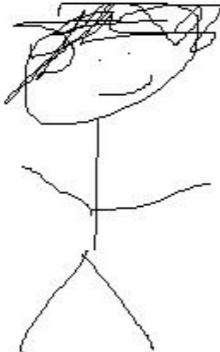
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## Ian-L

- Where are you from? New Hampshire
- What is your major and why did you choose it? Mathematics. I am good at Mathematics.
- What career do you hope to pursue upon graduating? Mathematics.

Here is some Mathematics I wrote:

$$a^2 + b^2 = c^2 \tag{1}$$


This is me.

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# How are my students using the wiki?

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## add a new page

  
  
[edit](#) [source](#) [print](#)[chat with D.C. Ernst](#)  
Mathematizing...



# How are my students using the wiki?

- Required to create a profile page



# How are my students using the wiki?

- ① Required to create a profile page
- ① Required to contribute a minimum of two entries to chapter summaries prior to each exam (the summaries are provided to them on the in-class portions of the exams)



# chapter 2 summary

[course information](#) » [chapter summaries](#) » chapter 2 summary

## Definitions

### Symmetry

A rearrangement of a geometric figure preserving the arrangement of its sides and vertices as well as its distances and angles.

### Rigid Motion

A map from a plane to itself while keeping symmetry of the object.

### Binary Operations

A binary operation or law of composition on a set  $G$  is a function  $G \times G \mapsto G$  that assigns to each pair  $(a, b) \in G$  a unique element  $a \circ b$ , or  $ab$  in  $G$ , called the composition of  $a$  and  $b$ .

### Group

A group  $(G, \circ)$  is a set  $G$  together with a binary operation  $\circ : (a, b) \mapsto a \circ b$  that satisfies:

1.  $\circ$  is associative:  $(a \circ b) \circ c = a \circ (b \circ c); \forall a, b, c \in G$ .
2. There exists an identity, denoted by  $e$  (or  $0$  or  $1$ ):  $a \circ e = e \circ a = a; \forall a \in G$ .
3. For each  $a \in G$ , there exists an inverse, denoted by  $a^{-1}$ :  $a \circ a^{-1} = a^{-1} \circ a = e$ .

### Identity Element

an element  $e \in G$ , such that for any element  $a \in G$ ,  $a \circ e = e \circ a = a$

### Abelian Groups

A group  $G$  with the property that  $a \circ b = b \circ a$  for all  $a, b \in G$  is called abelian or commutative. Groups not satisfying this property are said to be nonabelian or noncommutative.

### Non-Abelian Group

$S_3$  is an example of a 6 element group that is not abelian. 3!

$V_4$  is a non-abelian group that is the symmetry group for a non-square rectangle:  $\{e, h, v, r\}$

### Subgroup

A subgroup  $H$  of a group  $G$  is a subset of  $G$  such that the group operation restricted to  $H$  ( $H$  has the same operation as  $G$ ),  $H$  is a subgroup in its own right.

### Proper Subgroup

If  $H \leq G$  and  $H \neq G$ , then  $H$  is called a Proper Subgroup.

### Finite of Finite Order

A group is **finite**, or has **finite order**, if it contains a finite number of elements. If the group is not finite then it is said to be infinite or have infinite order.

### Order

The **order** of a finite group is the number of elements that it contains. The group  $G$  containing  $n$  elements is written  $|G| = n$ .

*Example-* The group  $\mathbb{Z}_5$  is a finite group of order 5.

## Theorems

### Proposition 2.1

Let  $n$  be a set of equivalence classes in the integers  $\text{mod } n$  and  $a, b, c \in \mathbb{Z}$ .

1. Addition and multiplication can be commutative:

$$a + b \equiv b + a \pmod{n}$$

$$ab \equiv ba \pmod{n}$$



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# How are my students using the wiki?

## Abstract Algebra Killers

Ninja's of Abstract Algebra

Search this site

Search

Homework

Study Sessions

- [Welcome page](#)
- [What is a Wiki Site?](#)
- [How to edit pages?](#)
- [How to join this site?](#)
- [Site members](#)
- [Recent changes](#)
- [List all pages](#)
- [Page Tags](#)
- [Site Manager](#)

### Page tags

homework

### Add a new page

new page

[edit this panel](#)

## Homework 5

### 2.15 Step 2. Associativity.

Proof. Let  $a, b, c \in S$ .  $S = \mathbb{R} \setminus \{-1\}$ .

We see that

$$\begin{aligned}(a * b) * c &= (a + b + ab) * c && (1) \\ &= (a + b + ab) + c + (a + b + ab)c \\ &= (a + b + ab) + c + ac + bc + abc \\ &= a + b + ab + c + ac + bc + abc \\ &= a + b + c + bc + ab + ac + abc \\ &= a + (b + c + bc) + a(b + c + bc) \\ &= a * (b + c + bc) \\ &= a * (b * c).\end{aligned}$$

Therefore,  $a * b$  is associative. QED

### 2.15 Step 3. Identity.

Proof. Let  $a \in S$ . We see that

$$\begin{aligned}&= a + 0 + a \cdot 0 && (2) \\ &= a\end{aligned}$$

and

$$\begin{aligned}0 \cdot a &= 0 + a + 0 \cdot a && (3) \\ &= a.\end{aligned}$$

Thus, 0 is the identity. QED

### 2.15 Step 4. Inverse

Proof. Let  $a, b \in S$ . We see that

$$a * \frac{-a}{1+a} = a + \left(\frac{-a}{1+a}\right) + a \left(\frac{-a}{1+a}\right) && (4)$$

collaborating on homework



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How do you get started  
making your own wiki?



# How do you get started making your own wiki?

- Choose a “wiki farm”



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# Wikidot in Education

Build the perfect classroom site using:

- Wiki language for documents
- Easy collaboration
- Private sites
- Flexible security model
- Math equations in your wiki

[Learn more »](#)

"Wikidots beauty is its simplicity. The ease of creating a good looking website is absolutely outstanding. Perhaps the best thing however, is the knowledge that the developers are truly committed, and listen to the users." — Tom Crowley

Get it now!

Business

Education

Personal / Blog

Community

Group Projects

### Blog

#### Code block improvements

22 Mar 2010, 19:16 -0-400 (4 days ago)

#### Feedback - we listen

19 Mar 2010, 12:24 -0-400 (8 days ago)

#### More advertising options for pro. Free sites stay ad-supported

17 Mar 2010, 04:33 -0-400 (10 days ago)

#### Wikidot - Going Forward

11 Mar 2010, 10:38 -0-500 (16 days ago)

#### Files service migrated to new servers

8 Mar 2010, 15:15 -0-500 (18 days ago)

#### 144 Seconds Downtime in February, Replacing Servers to Handle Growth

4 Mar 2010, 04:00 -0-500 (23 days ago)

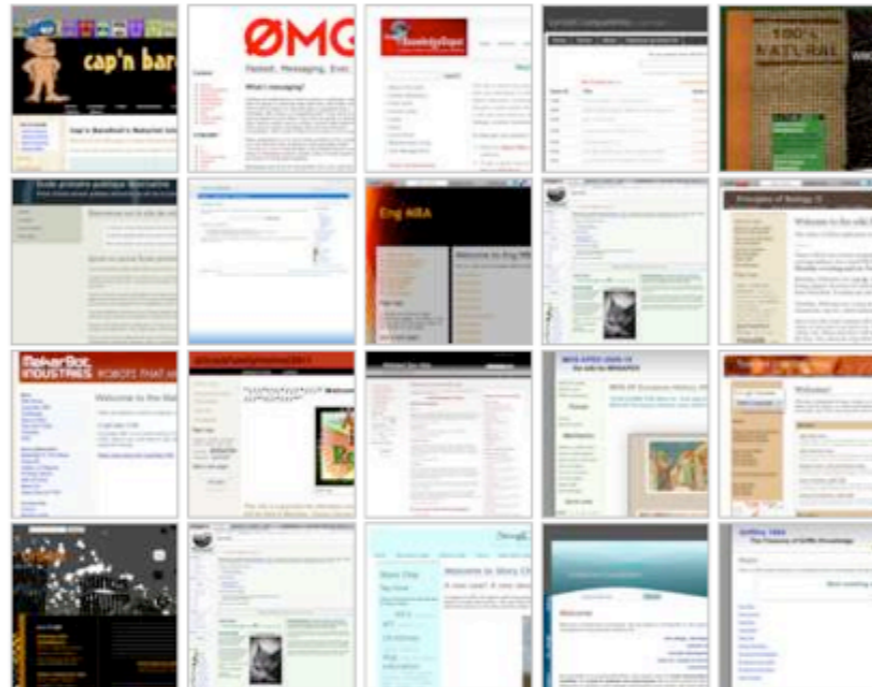
#### HTML easier than ever ;-)

2 Mar 2010, 07:02 -0-500 (25 days ago)

#### Good Morning, Wikidot!

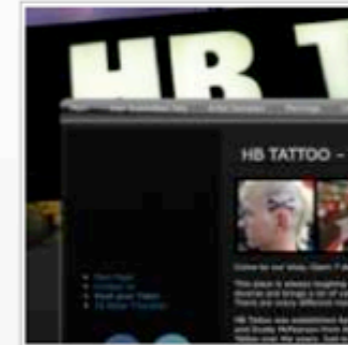
26 Feb 2010, 07:33 -0-500 (29 days ago)

### Featured Sites



[See what's hot »](#)

### Wiki Of The Week [more»](#)



### New users

- ;-) Logodesigns 3 minutes ago
- ;-) quit9smoking 5 minutes ago
- ;-) coolfag124 5 minutes ago
- ;-) Bryan6 5 minutes ago
- ;-) KWAME A 9 minutes ago
- ;-) nwes5150 10 minutes ago
- ;-) jhornung 12 minutes ago

Ch

it  
and



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Choose a "wiki farm"

wiki dot .com   Features   Opinions   Pricing   Advertise   Sandbox   Dana Ernst | My account

## wiki dot

Now it's easier than ever to build a website. Publish content, share your documents, collaborate with friends or coworkers, create a place for your community!

.wikidot.com **Get it now!**

Pages: **4 594 624**, Edits today: **12 907**, People: **459 951**, Signed-up today: **407**

**Get it now!**   Business   Education   Personal / Blog   Community   Group Projects

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# How do you get started making your own wiki?

## Get your free Wikidot site

Getting your new free Wikidot site is simple, and takes about a minute. A Wikidot site is much more than a wiki. Wikidot gives you a rich set of 'modules', like image galleries, forums and petitions, and web widgets.

Please read the [Terms of Service](#) and especially the sections on prohibited usage.

- Your new free Wikidot site will have some basic pages, ready to edit. Here's a tip: start your site slowly, don't add pages until you need them.
- You will be the administrator of the site, and you can invite friends and colleagues to help edit the site. Wikidot lets you share the work.
- You will be able to choose a new look & feel, and change all security settings. 'Manage site' is going to be your new friend.

Site title:	<input type="text" value="My Course Wiki"/>
	Appears on the top-left corner of your Wikidot site.
Tagline:	<input type="text" value="This course rocks!"/>
	Appears beneath the name.
Web address:	<input type="text" value="mycoursewiki"/> .wikidot.com
	Only alphanumeric [a-z0-9] and "-" (dash) characters allowed.
Site content language:	<input type="radio"/> English <input type="radio"/> Polish
Access policy	<input type="radio"/> Open — anyone can view and become member <input checked="" type="radio"/> Closed — anyone can view, but membership is restricted <input type="radio"/> Private — hidden, only members can access
Please confirm:	<input type="checkbox"/>
	I have read and agree to the <a href="#">Terms of Service</a> .
<input type="button" value="Get my free Wikidot site"/>	

□ PICK a name



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## • Create the site

- Pick a name
- Select general access privileges (can get more fancy later)



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- Start creating and editing pages



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- Other wiki farms include Wikia, Wetpaint, and Wikispaces.
- May require registration.
- Some require payment.
- Some have WYSIWYG editors.



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# Create a new page

Title of the page:



Just starting typing. You can use some of the tools above to insert pictures, videos, tables, links, math stuff, etc. Once you learn the syntax, you'll have total control.

Help: [wiki text quick reference](#) | [code snippets collection](#)



Short description of changes:

Max 200 characters (200 left)

You have an exclusive 15-minute lock that will stop others editing this page while you are working. The lock expires in **875** seconds of inactivity.



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Let's go play!



Let's go play!

My wiki is located at



Let's go play!

My wiki is located at  
<http://ma4140.wikidot.com>