

ONLINE TUTORING, HOMEWORK, AND ASSESSMENT FOR MATHEMATICS

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Is there an easy to implement,
low cost, readily modifiable,
scalable, and effective online system
for mathematics?

Online Math Website

- Content Repository
- Online Tutoring
- Homework
- Sample Tests, Assessment

Goals for Online Math Support Site

- Improve student math success.
- Keep local faculty in control while allowing for collaboration.
- Easier to implement than a full scale course redesign.
- Create modifiable model which does not require much bandwidth.

CSUN PILOT 2010-2011

- Online UC/CSU Mathematics Placement Test Preparation
- Individualized online tutoring for gatekeeper courses

Instructional Goals

Improve

- conceptual understanding
- procedural fluency
- problem solving

Problems fall into three types:

- one-step problems
- multi-step problems
- process problems

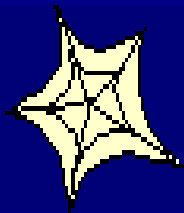
COMPONENTS

STUDENTS

Student Tutors

Faculty

DRUPAL



WeBWorK

Online, Free,
Modifiable
Content

MPT Site Design

Drupal – CMS, acts as the exterior shell

Moodle – LMS for content repository,
collaborative space for tutoring

Webwork – MAA and NSF funded National Problem Library free open source database of math problems used by 240 universities with over 20,000 problems from algebra – lower division college math courses.

Webwork is integrated with Moodle.

DRUPAL

Math Testing Center | Math Department Tutorial and Testing Center - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://mathweb1.sandbox.csun.edu/mpt/

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Math Testing Center | Math De...

California State University Northridge

Moodle Login Instructions (pdf) Enrollment tutorial (mp4) MPT tutorial (mp4) Math Moodle

Math Department Tutorial and Testing Center

MPT Preparation

- Information about MPT
- MPT Preparation 2011 course
- Tutors Schedule

MOODLE LOGIN INSTRUCTIONS AND COURSE ENROLLMENT

1. Initial Login

Open the link below:

<http://mathweb1.sandbox.csun.edu/moodle1/login>

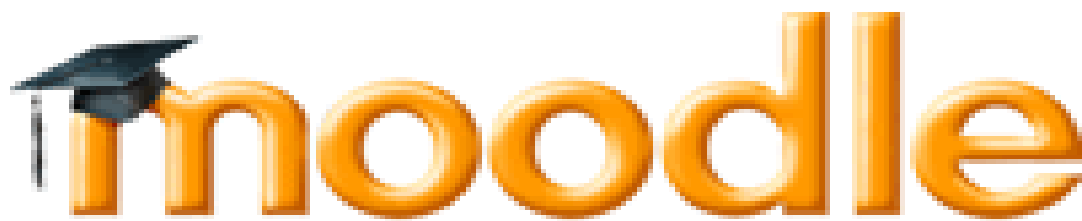
The following screen appears:

[Read more](#)

Transferring data from i2.ytimg.com...

Inbox - Outlook Web Access Light - Mozilla Firefox

<http://mathweb1.sandbox.csun.edu/mpt/>



Created meta-course for 6 sections of M150A Calculus I

Math-150A-Calculus-I-Online-Tutoring-Fa10: Webwork 2.5 problem 5 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://moodle.csun.edu/mod/forum/discuss.php?d=47820

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Math-150A-Calculus-I-Online-T...

Re: Webwork 2.5 problem 5
by [Varun Malhotra](#) - Wednesday, 8 September 2010, 09:09 PM

wouldn't that be

$$\frac{1-y}{y} = \frac{1}{y-1}?$$

[Show parent](#) | [Edit](#) | [Split](#) | [Delete](#) | [Reply](#)

Re: Webwork 2.5 problem 5
by [Varun Malhotra](#) - Wednesday, 8 September 2010, 09:00 PM

couldn't you cross multiply but even if you did i get

$$y = -y^2 + 2y - 1$$

[Show parent](#) | [Edit](#) | [Split](#) | [Delete](#) | [Reply](#)

Re: Webwork 2.5 problem 5
by [Alexander Alekseenko](#) - Wednesday, 8 September 2010, 09:32 PM

I do not think so: you had an expression, not an equation.

If we have

$$\frac{1-y}{y} =$$

we can not multiply "both sides" by $y - 1$, simply because there is only left side. Right side does not exist. You can write in the right side something that is equal to the left side (in some special sense), but you can not use tricks for solving equations because there is no equation.

Now you would be right if you had

$$\frac{1-y}{y-1} = 1$$

But this is a totally different problem -- has nothing to do with our stuff -- and actually we do not need this. Let's go back and try to simplify the mixed quotient.

Done



The Mathematical Association of America and the National Science Foundation funded the development of the National Problem Library free open source database of math problems used by 240 universities with over 20,000 problems from algebra to lower division college math courses.

Webwork is integrated with Moodle.

- *Single sign-on*
- *Integrated gradebook*

EXCELLECT FREE CONTENT FOR MATH

Using an open-content, web-based collaborative models, many contributors are working towards developing high quality educational content that will serve both as core text as well as provide an adaptive environment for learning.

Mathematics Placement Test Preparation

Applications Places System Mon Jul 25, 7:55 AM **carol**

Course: MPT Preparation 2011 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

<http://mathweb1.sandbox.csun.edu/moodle1/course/view.php?id=25&sesskey=alwOprVT6u&switchrole=5> news

Most Visited Release Notes Fedora Project Red Hat Free Content

Course: MPT Preparation 2011

California State University **Northridge** MPT Preparation 2011

You are logged in as **Carol Shubin**: Student ([Return to my normal role](#))

[Return to my normal role](#)

Math Moodle ▶ MPT 2011

People [Participants](#)

Activities [Chats](#) [ForumNGs](#) [Forums](#) [Quizzes](#) [Resources](#) [WeBWork Problem Sets](#)

Administration [Grades](#) [Profile](#)

Topic outline

Basic facts about the MPT and how to use this site

- [News Forum: Tutor Schedule](#)
- [Information about the MPT](#)
- [MPT course tutorial in flash video](#)
- [How to start a forum or chat](#)
- [How to post a Forum](#)
- [Enter a chat room](#)

1 Take a sample test

- [Input solutions for the practice MPT](#)
- [MPT -- interpret your results](#)

2 Quick Review

- [Algebra Cheat Sheet by P. Dawkins](#)
- [Trig Cheat Sheet by P. Dawkins](#)

3 Additional Review Problems

- [Post a Forum: Ask Questions About Webwork Problems](#)
- [Introduction to Webwork](#)
- [Functions](#)

Latest News (No news has been posted yet)

Recent Activity Activity since Saturday, 23 July 2011, 07:56 AM [Full report of recent activity...](#) Nothing new since your last login

WeBWork Link Connected to WeBWork Course: mpt_practice_2011

Done

Course: MPT Preparati... draft_aascu__7_2011....

TUTORING

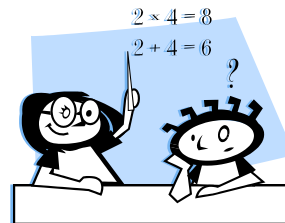
- Tutoring is a type of supplemental instruction; it does not replace regular instruction.
- Students seek tutors' help, and can form strong lasting teaching influence on a student.
- A reliable tutoring service can raise passage, retention, and graduation rates.

On-Campus Tutoring Centers

- ❑ Students receiving a B or better are eligible to become tutors
- ❑ Usually, a professor's note of recommendation is sufficient
- ❑ Tutors are placed in the labs or in classrooms on campus and their times advertised



Tutoring Centers



Individual Student Tutors

- ☹ **Students use tutors as solution manuals**
- ☹ **Tutors' knowledge of content may be weak**
- ☹ **Tutors' pedagogical experience is very limited**
- ☹ **No supervision or record of tutors' work**

Many Online Tutoring Services Exist

The following is the response I received from TutorVista.com on my question to explain how to solve inequality $|x-3| < 6$

The screenshot shows a tutoring session interface. On the left is a chat log with the following messages:

- [01:41:25 AM] Tutor : hi
- [01:41:28 AM] Guest : Hi,
- [01:41:36 AM] Tutor : Please type your question so that we work on it together.
- [01:41:36 AM] Guest : Here is my question.
- [01:41:47 AM] : Can you please explain me how to solve this problem:
- [01:42:02 AM] Tutor : ok
- [01:42:03 AM] Guest : find all values of x that satisfy $|x-3| < 6$
- [01:42:17 AM] : I do not know where to start
- [01:44:05 AM] : so my answer is $x > 9$?
- [01:45:28 AM] Tutor : is it clear
- [01:45:46 AM] Guest : can you please wait --- I am thinking about it ...

On the right is a whiteboard with handwritten text in red ink:

See
 $|x-3| < 6$
mean $x-3 < 6$ OR $-(x-3) < 6$
 $x < 6+3$ $x-3 > 6$
 $x < 9$ $x > 6+3$
 $x > 9$



A tutor will join you shortly. Please type your name and grade so that the right tutor can assist you.

- Get 24x7 tutoring in Math, English and Science.
- Unlimited personalized tutoring makes learning fun and easy.
- Complete your homework anytime, no appointment required.
- Join the thousands of students taking our world-class tutoring.

Subscribe



My Experience with Online Tutors

- Incorrect solutions were provided.
- The interaction with the tutor was very limited, probably because tutors are very busy.
- Understanding of the content was not evaluated.

Overall, we see some old challenges:

- ☹ **Students use tutors as solution manuals**
- ☹ **Tutors have weak knowledge of content**
- ☹ **Tutors have limited pedagogical experience**

And some new:

- ☹ **Tutors are probably overworked**
- ☹ **Communication is limited for technical reasons**

Online Tutoring Centers

- Supervision and training
- Convenient location
- Reaching more people



Supervisor

Tutors

Students



On campus

On the go

From home

The Pedagogy of Online Tutoring

- Builds independent problem solving through questioning.
- Provides students and tutors with an opportunity to improve their written communication skills.
- Faculty have a clear picture on level of understanding before the test.

CSUN Online Math Tutoring

- **Mode of communication:** forums, chats, but video and audio is possible.
- **Software:** Moodle enabled with LaTeX scripting, ASCIIMATH, and HTML editing
- **Hardware:** located on a math dept server.
- **Who can participate:** CSUN can ask questions, open for view to everyone.
- **Who is handling the communication:** Student tutors supervised by faculty.

Calculus I Math Tutoring Site Usage 2010-11

- Tutors were available five nights a week for 3 hours per night.
- More than 40% of the class used the tutoring site.
- Tutor and student growth in Q&A develops over time.

However,

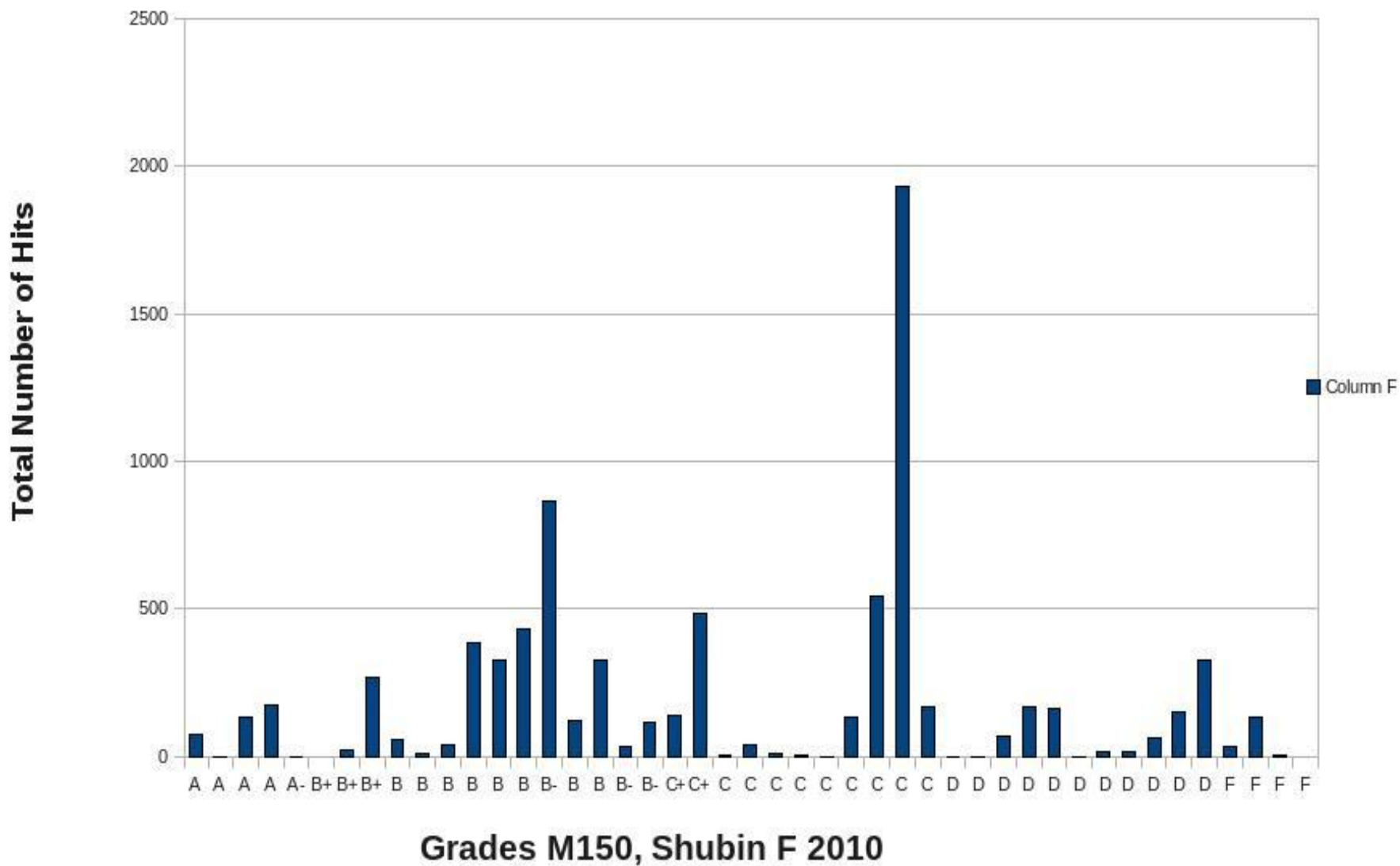
- Most of the visitors are passive.

Measures of Effectiveness

Count number of return visits per student as a measure of usefulness of the site

Correlate with grade and other student attributes

Shubin M150A Grades vs Number of Hits on Tutoring Site, Math Online Tutoring Center, Fall 2010



Evaluation Methods

- Site usage; frequency, quality of question response interaction
- Evaluation of tutor's communication skill gains
- Survey students, tutors, and supervisors
- Service to self-identified disabled students and repeaters
- Study individuals, classes, multi-section
- performance
- Accessibility reports
- Universal design reports, evaluation of tools

Advantages of CSUN Tutoring

- Asynchronous forum mode: inexpensive and efficient.
- Re-use and recycle: materials can be pre-selected and re-used.
- Opportunity for training: tutors receive feedback from the supervising professor, both positive and negative.

Online Math Tutoring Center Scale-up, Spring 2011

- **Online tutoring was successfully run in Calculus I, Business Calculus, and Introductory Statistics**
- **27 Tutors, 5 faculty supervisors**
- **More than 3000 students have access**

What's Next? Outreach to local high school students was initiated and proposals for funding to work abroad.

Online Tutoring at CSUN

- Will provide a controlled quality inexpensive tutoring
- Student assistants receive training while participating in online tutoring. This prepares them to be better teachers.
- Innovative use of technology can change the landscape of student outside of the class interaction by making learning more social learning.



Search CSUN [input] Submit

- Home
- Toolkit
- Guides
- Templates
- Free Software
- Section 508 Review
- Math Content for the Web

Universal Design Center

Accessible Technology Initiative

Accessibility

Learners

Curriculum Goals

- ATI Coordinators
- Contact Us
- Newsletter
- CSUN ATI Policies and Annual Reports

Save Time and Money

- Save Time and Money — Avoid Printing Documents!
 - Across campus, individuals are learning how to create documents that can replace the need to print while still maintaining smooth navigation and usability of the document.
 - For course materials considering leveraging free Web resources and CSUN database materials via the Library to save students' money.
 - Offer materials electronically to provide flexibility and ease of access.

Email us to find out more or schedule a session.



Provost Hellenbrand

Universal Design in Education

Principles of Universal Design in Education provide a framework for designing curricula that enables all individuals to gain knowledge, skills, and enthusiasm for learning. UDE provides support for learning and reduces barriers to the curriculum while maintaining high achievement standards for all (CAST, 2009).

How does Universal Design relate to ATI?

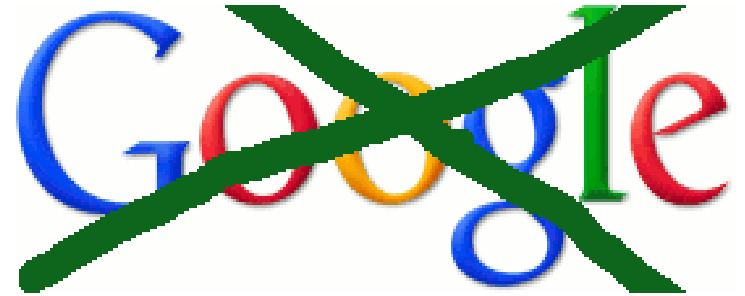
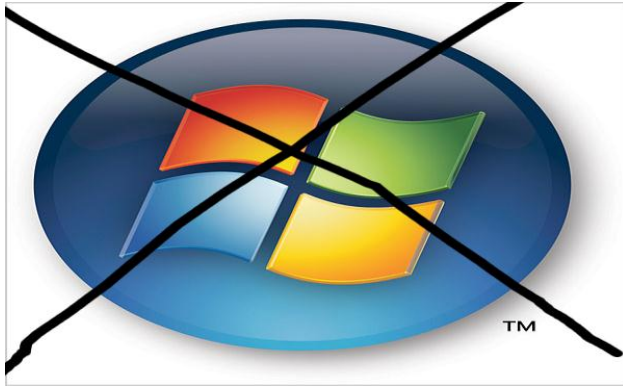
The principles of Universal Design are based on teaching to all students regardless of their individual processing styles or characteristics. Disability is just one of many characteristics that an individual may possess. Designing ways to access information and technology in a fashion that is useable to everyone helps support the California State University's (CSU) ongoing commitment to provide access for individuals with disabilities. More information can be found at [The Trace Center's Accessibility/Universal Design Information](#).

Announcements

Universal Design

Goal: create pathways for individuals to learn, communicate, and share via information technology, regardless of their individual learning and processing styles, or physical characteristics. Based on designing-in interoperability, usability, and accessibility

KEEP IT SIMPLE



WIN-WIN SITUATION

Students – learn more, no cost, flexible hours

Student Tutors – make money, gain experience, improve communication skills, work flexible hours

Faculty – reduce workload, maintain local control or go with system

Provosts – Increase SLO and graduation rates

SUMMARY

Given tough financial times, it is great to know that there are faculty created solutions to problems in higher education that are effective, low cost, easy to implement and engage students in a learning-centered environment.

THANKS

The PIs thank Provost Harry Hellenbrand, Academic Technology, Institutional Research, the College of Science and Mathematics, the Department of Mathematics, and Developmental Math for their support. We also thank the Pioneering Technology Group for providing the virtual server.

A heartfelt special thanks to our wonderful tutors and to our students!