Math 8001: Teaching with Technology

April 27, 2012

Any current issues in your own teaching?

Outline

- Webpages - Personal and CMS
- Incorporating Technology into Class
- Webwork (online homework system)

Webpages

In today's world we no longer default to handing out course announcements and other materials in person, on paper.

An aside: a webpage is an important part of your professional identity. Create one, make it informative, and keep it current!

Webpages

A webpage does not need to be complicated, colorful or flashy to impart information effectively.

–Paul Garrett

Webpage Options

- Your own course page. (Use the Math 8001 as a template, if needed.)
- Course Management Systems, e.g. Moodle.

Incorporating Technology in Class

There's a wide spectrum here.

- Technology can be a major component of the class (think: Math 2374). This can work well, or poorly, depending on whether the technology is truly an integral part of the course.

- At a minimal level, you can use applets as in-class demonstrations. Issues:
  - Set everything up beforehand!
  - Ask yourself: will this actually help? When should I use the applet?
  - How to find good applets? (MAA Course Communities?)

  If we have time at the end, I can say much more about what makes for a good visualization.

Online Homework Systems

WeBWorK is one of many web-based homework systems, all of which have several common features:

- Questions are *randomized*, so that each student gets the same types of problems, but with numbers slightly changed.
- Can do multiple choice, matching, T/F questions, etc.
- Can check decimal answers ($1.73\ldots$), exact answers ($\sqrt{3}/2$), intervals ($[0,1]$), expressions ($x^2 - x + 1$), inequalities ($-1 \leq x < 2$) or equations ($y = 3x - 1$)

Webwork

Webwork was developed by the math department at the University of Rochester. It is now used at over 240 schools.

Advantages/Disadvantages:

- **Absolutely FREE** and open source. Supported by extensive network of skilled volunteers.
- ...but ultimately, you (or your IT staff) are on your own. There is no 24-hour customer support line.
- Creating new problems requires computer programming skills. Adding hints and customized error messages can be tedious.
- ...but there are 29,000 problems in a *National Problem Library* for a variety of courses.

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WebWork and the MAA

The MAA now has a large grant from the NSF to support WebWork.

In particular, you can have a course hosted on the MAA's servers, instead of installing it on your own.

ALEKS and WebAssign

ALEKS and WebAssign are commercial systems which charge per student per semester. (For college courses the fee is often added to the price of a textbook.) Advantages/Disadvantages:

- Beautiful web interfaces. (Which can be slow!)
- You are beholden to the company's website.
- Integration with more textbooks (can be spotty)
- ALEKS: adaptive questioning and tutoring

WebAssign Entry

1. algl-rn

Evaluate each expression if $a = 1.4$, $b = 24$, and $c = 1/4$. Numbers in red are randomized.

a) $0.2 + a =$ 1.6

b) $abc =$

Enter a number.

c) $3c - ab =$

Grade This | Show Answer | Try Again

WebAssign Response

1. algl-rn

Evaluate each expression if $a = 1.4$, $b = 24$, and $c = 1/4$. Numbers in red are randomized.

a) $0.2 + a =$ 1.6 ✓

b) $abc =$ 1.4*24*1/4 ✗ Check the syntax of your response.

c) $3c - ab =$ 3/4-*1.4*24 ✗ Check the syntax of your response.

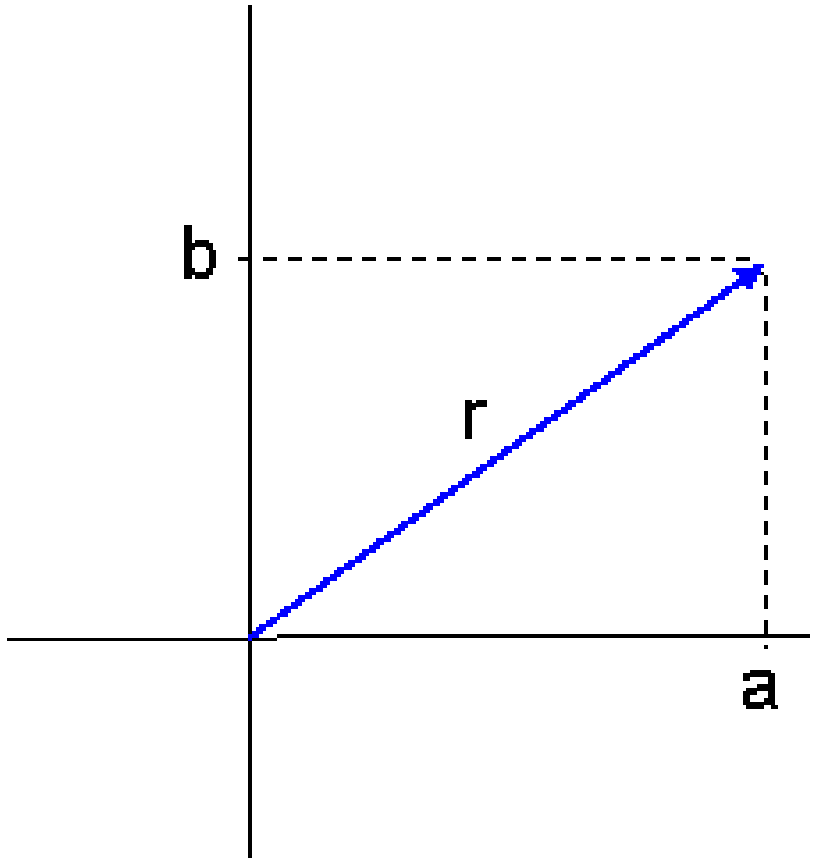
Grade This | Show Answer | Try Again

WebAssign MathPad

1. 1/1 points All Submissions Notes

Symbolic

Write an equation for the length of the blue line labeled r in the image below?



mathPad BETA

+ − × ÷

Functions

Symbols

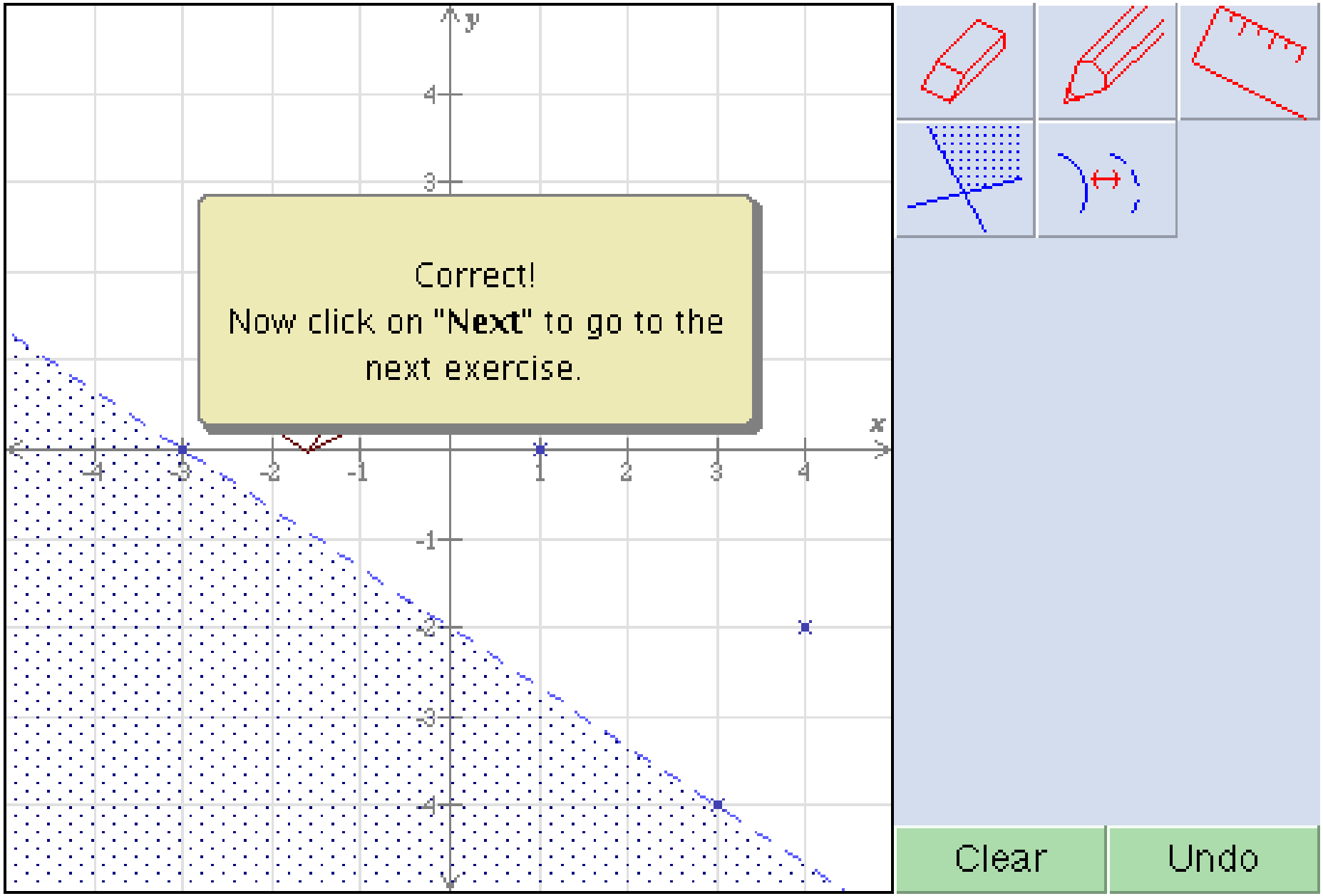
Relations

Sets

Trig

sin cos

ALEKS Graphical Entry I



ALEKS Graphical Entry II

Question #2

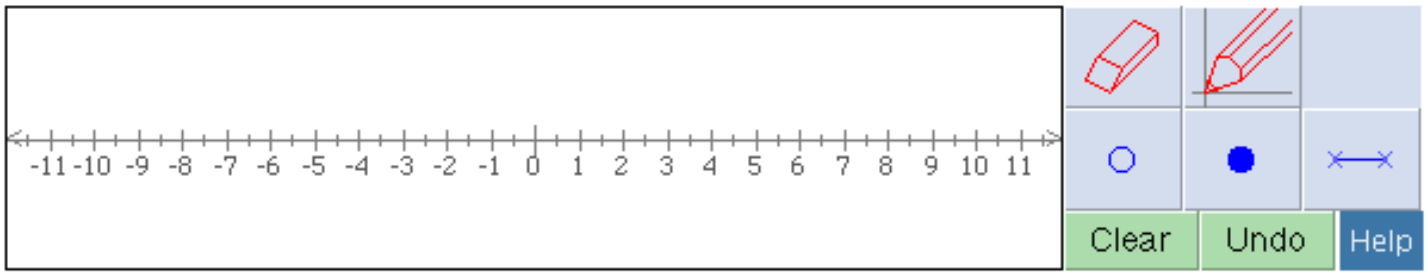
Assessment Progress

Graph the solution to the inequality on the number line.

$$|x+5| < 4$$

Quick Help

How do I enter my solution?



Next >>

I don't know

Webwork at UMN

We chose Webwork because of its cost, flexibility, and our computer geekiness.

- Started in 2009 with 165 students in UMTYMP Algebra
- Currently used by 750 students in a range of courses.
- We **always** use it in conjunction with other written homework or quizzes. The goal is to give students more feedback on the "drill" type problems which weren't always graded.

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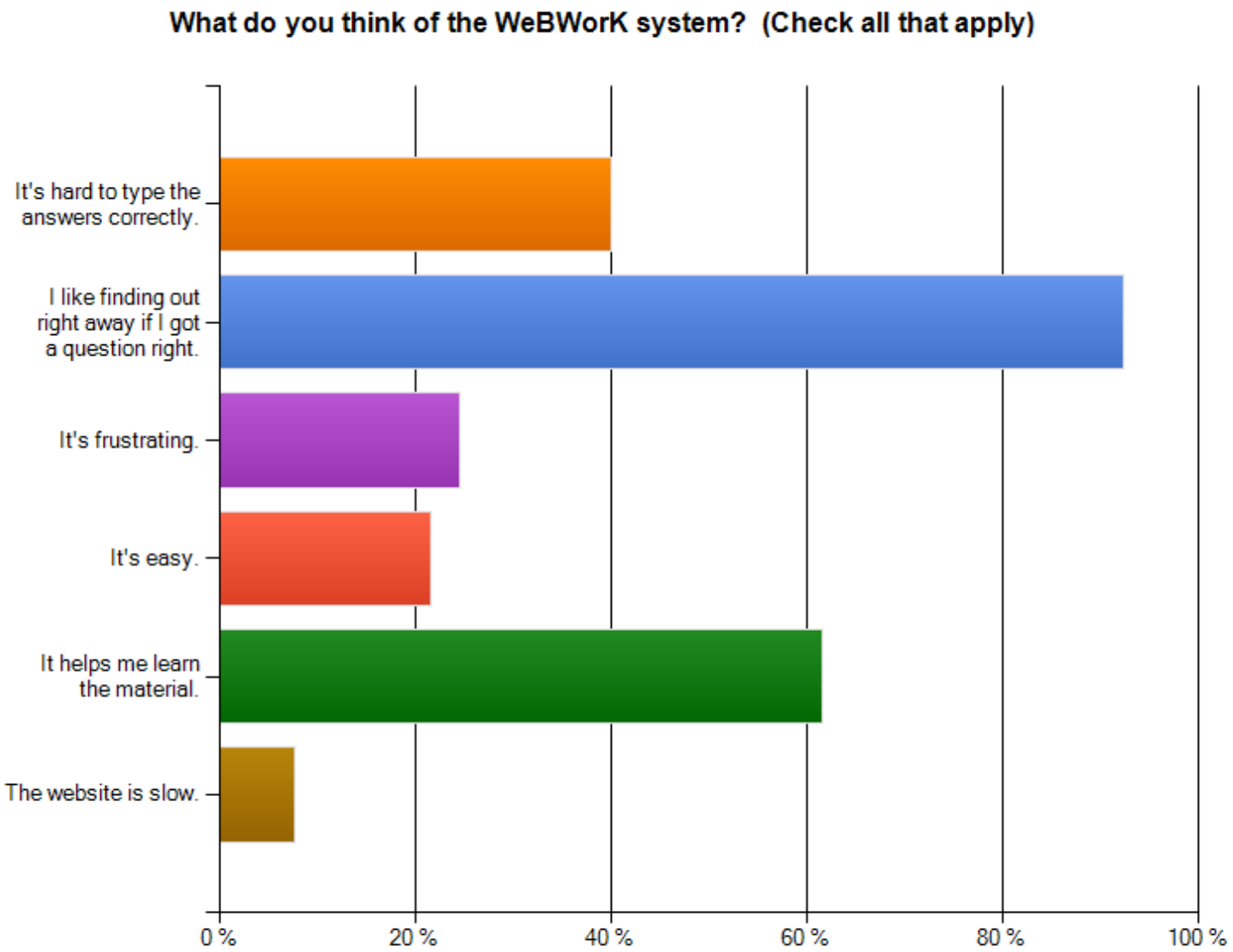
UMTYMP Calculus I Opinions



Effect of WeBWorK on Homework Time

Before Webwork, most of our UMTYMP Algbera students spent 6-10+ hours on their homework each week. With Webwork:

3. On average, how much time does it take to complete your UMTYMP Algebra homework?

	0-2 Hours	2-4 Hours	4-6 Hours	6-8 Hours
Online WeBWorK Portion	**67.3% (109)**	29.0% (47)	3.1% (5)	0.6% (1)
Handwritten Portion	34.0% (55)	**49.4% (80)**	12.3% (20)	3.7% (6)
TOTAL	8.0% (13)	28.4% (46)	**38.9% (63)**	17.3% (28)

Student performance on quizzes and exams has remained consistent with previous years.

AMS Homework Software Survey

Key Findings

Overall, users were happy with homework software; almost no department discontinued or reduced its use.

Current users were more positive about the benefits of homework software than prospective users and much less concerned about drawbacks than prospective users: the primary benefit being better student learning; the primary drawback being students not showing their work.

Notices of the AMS, Vol. 57, No. 6 (June/July 2010), p.753

Demonstration time!

Homework

Your HW: login with your x500 id and your student ID as your password. Complete the "Orientation" assignment and at least some of another assignment of your choice.