

SIUE faculty guide to using WeBWork

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¹ written under the support of EUE Grant 10-35

Introduction

We intend that this manual will become a resource for faculty wanting to learn more about WeBWork and implement WeBWork in their courses at SIUE.

What is WeBWork?

WeBWork is an online computer-based homework system designed at the University of Rochester specifically for mathematics. It is an open-source software system that is entirely internet based; it does not require that the students or faculty install any software or use any particular internet browser. Instructors using WeBWork create homework assignments by choosing problems from a menu of available problems. These problems are written in a computer language that allows the WeBWork system to algorithmically generate distinct problems for students. Therefore, two students in the same class will be given similar assignments, but the numbers and other details in the problems will differ. This customization reduces the prevalence of academic dishonesty and helps to ensure that all the students work on and understand their own homework assignments. Instructors have various options, including the ability to give hints, show solutions, and get feedback from students about the problems.

Why WeBWork over other homework systems (WebAssign, MyMathLab, etc.)?

Since WeBWork is open-source software, it is, by its essence, much more customizable than commercial products. Over 17,000 problems have been coded and added to a national problem bank, and you can freely modify these or write your own problems to assess specific computational tasks. Unlike courses with special access codes that only work for one specific text, once you learn how to use WeBWork, you can use it in any of your courses. Additionally, WeBWork is and will always be free for students to use, removing the need for subscription fees and tracking down access codes. Also, WeBWork makes it easy for students and faculty to communicate about their homework assignment and the problems that they are having. This changes the dynamic of the classroom and provides assistance to students when it is needed.

Can WeBWork be used for more than just homework?

Yes. WeBWork can be used for quizzes, offered either outside of class or in a proctored environment. As part of our EUE grant, we coded problems from the 112A competency exams into WeBWork, to allow for automated proctoring of this exam. This will save each 112A professor hours of grading per semester, as well as providing a valuable practice tool to the students.

What do I need (hardware/software/etc) to run WeBWork?

Just an internet browser and an e-id. We purchased a server to run the underlying software with an instructional equipment grant, and wrote up these documents under an EUE grant. Our goal is to make it easy for others to use this tool to provide rapid assessment of homework for our students.

Setting up a course

Currently, to set up a course for WeBWork, the instructor should send an email to Adam Weyhaupt (aweyhau@siue.edu) with the course number, section, and semester of the course. (Example: Math 152, Section 007 008 009, Fall 2010.) Your WeBWork course will receive the standardized name CAS_MATH152_007_008_009_F10. Share this name with your students – they will select this course from a list when they log into the program.

Logging in

Go to <https://webwork.siue.edu> and select your course from the list. You will be prompted for a username and password – this is your SIUE e-id and corresponding password. After logging in, you will be taken to a page with a list of all assigned homework sets, as well as the main menu.

Guide to the Main Menu:

Here we overview the most useful components of the professor's view of the main menu:



Homework Sets – shows the list of *assigned* (deployed to students) homework sets you have created. Does not show sets you are in the process of creating. This is where students will go to access their assignments.

Grades – this is where your students will click to see their progress on all assignments. (You will access their scores in **Student Progress**)

Hmwk Sets Editor – allows you to access, edit, and create homework sets, whether or not they have been deployed

Library Browser – gives you access to over 17,000 problems indexed by subject, topic and/or text

Scoring Tools – go here to download a spreadsheet (.csv file) of student grades on selected assignments

Crafting an assignment – the Hmwk Sets Editor

In the next two sections we give an overview of the most common ways to create and edit assignments: via the “Hmwk Sets Editor” or through the Library Browser. We consider first the Hmwk Sets Editor, available under “Instructor Tools” on the Main Menu.

WeBWork → ADM_MATH_STAT_WEBWORK_SP10 → Instructor Tools → Hmwk Sets Editor

Hmwk Sets Editor

Select an action to perform:

- Show (separate multiple IDs with commas)
- Primary sort: Secondary sort:
- Edit
- Make for students.
- Import from with set name(s):
 assigning this set to
- Export
- Score
- Create a new set named: as
- Delete *Deletion destroys all set-related data and is not undoable!*

Above is an image of the options available within the Homework Sets Editor. To start out, we will choose “Create a new set named...” Select the radio button to the left of this option, type a name for your homework set (such as “Homework1”) into the box, and click the button to take action. At the top of the page, you will receive the following Feedback:

Hmwk Sets Editor

Results of last action performed: Successfully created new set Homework1

You will also now see “Homework1” appear in your list of homework sets below the “Take Action!” button. The small pencil icon to the right of the set name allows you to edit global properties of the homework set, or you can click on the number of problems in the “Edit Problems” column to change or add specific problems.

Edit Set Data	Edit Problems	Edit Assigned Users	Visible
Homework1	0	0/9	Yes

By clicking on the pencil icon next to a homework set's name, you are taken to the screen shown below. There you can change:

- visibility (whether or not students can see that the set exists)
- open date (when the students will first be able to see the set)
- due date
- answer date (when the solutions will be made available)

NOTE: You must choose "Save changes" and click the "Take Action!" button for your changes to affect the given homework set.

Hmwk Sets Editor

Any changes made below will be reflected in the set for ALL students.

Select an action to perform:

Abandon changes

Save changes

Showing 1 out of 4 sets.

Edit All Set Data	Visible	Open Date	Due Date	Answer Date
Homework1	<input checked="" type="checkbox"/>	07/12/2010 at 03:35pm CDT	07/19/2010 at 03:35pm CDT	08/19/2010 at 03:35pm CDT

Clicking on the name of the homework set on the above page enables you to change further details such as the headers (material printed at the top of the online and hardcopy homework sets) or individual problems.

Setting a due date

As mentioned above, this can be done via the Hmwk Sets Editor, by clicking on the pencil icon next to the name of the problem set and saving any changes you make to the dates on the following page.

Making homework available to the class

Two key steps are needed. First, the set must be made visible. By default, a new set will be visible upon first being created. However, for the preloaded 112A homework sets, you will need to set the date for these assignments to be visible. Second, the "open date" must be set for the day/time you would like the students to be able to access the next homework set. If a set is visible but not yet open, your students will be able to see the name of the set, as well as when it will open and when it will be due.

Choosing questions – the Library Browser

Although it is possible to write and encode your own problems, one strength of the WeBWork system is the community of users who have made their 17,000+ coded problems available for use. The Library Browser enables you to add problems to an existing set (called your “Target Set”) or to create a new homework set on the fly.

The screenshot shows the WeBWork Library Browser interface. At the top, a purple navigation bar contains the text: WeBWork → CAS_MATH321_001_002_FA10 → Instructor Tools → Library Browser. Below this, the title "Library Browser" is displayed in blue. The main interface is divided into several sections:

- Add problems to Target Set:** A dropdown menu labeled "Select a Set from this Course" and an "Edit Target Set" button.
- Create a New Set in This Course:** A text input field labeled "Name for new set here".
- Browse:** A section with buttons for "National Problem Library" and "Local Problems". Below these are buttons for "From This Course" and "Set Definition Files".
- or Problems from:** A section with buttons for "NPL Directory", "Rochester", "SIUE", and "Union".
- Filters:** Three dropdown menus for "Subject: All Subjects", "Chapter: All Chapters", and "Section: All Sections". To the right are buttons for "Update Chapter/Section Lists" and "Advanced Search".
- Display Options:** A "View Problems" button, a "Display Mode: images" dropdown, and a "Max. Shown: 20" dropdown. Below these are checkboxes for "Hints" and "Solutions".
- Results:** A message stating "There are 17250 matching WeBWork problem files".
- Actions:** A row of buttons including "Mark All For Adding", "Clear All Marks", "Update Set", "Rerandomize", and "Clear Problem Display".

The National Problem Library contains problems from a range of mathematical courses, from college algebra to statistics to complex analysis. In the Browse section, click on “National Problem Library”. Then select a subject from the drop-down menu to further refine your search. As an example, selecting the subject “Calculus” retrieves over 8000 problems, from over twenty chapters such as “Limits and Derivatives” (1000+ problems) or “Techniques of Integration” (600+ problems). The choice of section refines the search even more, with choices including continuity, the derivative as a function, or integration by partial fractions, trigonometric substitution, or parts.

“Advanced Search” allows you to search by textbook chapter and section. For example, you can search for Stewart, Calculus: Early Transcendentals 6ed., and then problems pertaining to Chapter 1, Section 5. (There are 16 problems matching these criteria.)

Local problem banks – The SIUE button

We have coded questions from the course text for 112A into WeBWork format. You can access these by clicking on the SIUE button in the browse window. Here you can also access an “Orientation” problem set to introduce your students to navigating within WeBWork and entering mathematics. You may choose to edit these problems to fit the needs of your specific course. You may wish to write your own problems, which we can add here. Adam would be happy to help you write a small number of problems or point you toward resources where you can learn about writing problems.


How to add problems to a set

Once you have specified your search criteria, clicking the “View problems” button will generate a list of problems below the search box. You will see a version of the problem, and will be given hyperlinks to edit or try the problem, as well as a checkbox for adding the problem to your target set. Check the boxes of problems you wish to add and then click “Update Set” to include them into your assignment. A green status message in the upper right corner of the screen will indicate that you successfully added problems to the set.

<input type="button" value="Mark All For Adding"/>		<input type="button" value="Clear All Marks"/>			
<input type="button" value="Update Set"/>		<input type="button" value="Rerandomize"/>		<input type="button" value="Clear Problem Display"/>	
File name: Library/UVA-Stew5e/setUVA-Stew5e-C06S04-Work/6-4-01.pg Edit it Try it					
<input type="checkbox"/> Don't show this problem on the next update					
<input type="checkbox"/> Add this problem to the target set on the next update					
The force on a particle is described by $7x^3 - 5$ at a point x along the x -axis. Find the work done in moving the particle from the origin to $x = 3$. <input type="text"/>					
File name: Library/UVA-Stew5e/setUVA-Stew5e-C06S04-Work/6-4-03.pg Edit it Try it					
<input type="checkbox"/> Don't show this problem on the next update					
<input type="checkbox"/> Add this problem to the target set on the next update					
Work of 4 Joules done in stretching a spring from its natural length to 11 cm beyond its natural length. What is the force (in Newtons) that holds the spring stretched at the same distance (11 cm)?					
Answer: <input type="text"/> Newtons					

Editing your problem set

Go into the Hmwk Sets Editor, and click on the number of problems within the Edit Problems column.

Edit Set Data	Edit Problems
Homework 1 	<u>3</u>

This will take you to a page where you can edit characteristics of each problem. The default display mode (“None”) will show the name of the source file. By changing this setting to “images,” you can see a version of the problem.

Problems	Data	Display Mode: images <input type="button" value="Refresh Display"/>
<div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;"> 1 <input type="button" value="v"/> </div> Edit it Try it <input type="checkbox"/> Delete it? <input type="checkbox"/> Mark Correct?	Weight <input style="width: 50px;" type="text" value="1"/> Max attempts <input style="width: 100px;" type="text" value="unlimited"/>	Source File <input style="width: 100%; border: none;" type="text" value="Library/Rochester/setLinearAlgebra3Matrices/ur_Ch1_"/> $\begin{aligned} -9x - 7y + 5z &= 3 \\ -6x + 8y + 7z &= -4 \\ -2x + 7y - 6z &= -5 \end{aligned}$ Write the above system of equations in matrix form: $\begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix} * \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \boxed{} \\ \boxed{} \\ \boxed{} \end{bmatrix}$

Common tasks you can accomplish within this editor include:

- trying or editing a problem (opens a new window)
- reordering the problems (via the drop-down number in the “problems” column)
- reweighting the problems (default is each problem worth 1 point)
- changing the maximum number of student attempts allowed (default is unlimited)
- deleting a problem from your homework set

Number of student attempts allowed per problem

The default setting is “unlimited,” but you can change this via the Hmwk Set Editor, in the Data column displayed above.

Checking the guts of a problem

By clicking “Edit it,” you can see the code for a given problem. Here you can observe or fine tune the range of values WeBWork will use to randomly generate problem sets.

Writing your own problems

Have a problem in mind but can’t find it in the library? You can write your own problems from scratch or by modifying an existing problem. See “Useful Resources” below for a link to a page for problem authors. Adam would be happy to write a small number of problems.

Student Progress – viewing attempts and summaries

There are two main ways to view progress: by assignment or by individual student. Under Instructor Tools in the Main Menu, click on Student Progress. Then you can either select the problem set of interest or an individual student's name.

View student progress by set

Clicking on the link for a homework set here gives you a summary of each student's performance on the set. Details include the number of incorrect attempts made on each problem, any partial credit awarded, and the total number of points earned.

View student progress by student

By clicking on the link of an individual's name, such as the fictional "Abel Student" whose info is shown below, you will see a summary of the student's work on all assignments. Here is a quick key to decoding the info in the Problems column:

C means they got the problem correct

0-99 in the top row indicates the percentage of partial credit earned

0-99+ in the bottom row gives the number of incorrect attempts

The "Score" column contains the total points earned by the student, including any partial credit. The "Ind" column gives a measurement of performance that takes into account the number of attempts needed to get the problems correct.

Student Progress for [CAS MATH150_025_026_027_FA09 student`astudent](#)
[astudent@siue.edu](#)

Section:
 Recitation:
 Act as: [astudent](#)

Abel Student

Set	Score	Out Of	Ind	Problems
ch1sec16 continuity	14.00	14	82	C C C C C C C C C C C C C C C 0 0 0 0 0 0 0 2 0 0 0 0 1 0 0
ch1sec1 limits	6.67	8	14	C 67 67 67 67 C C C 3 5 11 6 9 0 0 0
ch1sec3 limitthms	11.00	11	58	C C C C C C C C C C C 0 0 1 0 0 0 0 3 0 2 2

Viewing submitted student answers

If you click on the name of a homework set in the above menu, you will see a list of the problems contained in that set. You can then click on a specific problem and then select "Show past answers" to see all of the answers submitted by a particular student.

Grading

Most of the work is done for you!

Where/how are grades stored?

Students can keep track of their progress at any time by logging into WeBWork. To view summaries by problem set or by student, click on the link for Statistics. As the professor, you have the ability to view all attempts of each member of the class to any given problem.

Can I pull WeBWork grades into Blackboard? Excel? Other programs?

To download a spreadsheet of all student scores, go to Scoring Tools. Use the CTRL-key to select multiple problem sets, then enter a name for your spreadsheet .csv file. After you click the button to save, a link will appear that allows you to download the file and open it with your favorite spreadsheet software. To integrate this into Blackboard, you will most likely need to modify the .csv file for import. Assistance with uploading grades to Blackboard is beyond the scope of this document.

I goofed and need to mark #5 correct for all students.

Hey, it happens. Go into the Hmwk Sets Editor, and click on the number corresponding to the number of problems in your homework set within the Edit Problems column. Once you are on the page where you can see the list of problems, check the “Mark Correct?” box to give all students credit for a specific problem.

I need to correct a problem’s grade for just one student.

Go into the Hmwk Sets Editor, and click on the number corresponding to the number of problems in your homework set within the Edit Problems column. Once you are on the page where you can see the list of problems, a link at the top of the page will allow you to “edit individual versions.” Follow that link, then select “Edit data for [your student’s name]” on the following page. Scroll down to the offending problem(s), and change the “Status” from 0 to 1. Then select “Save changes.”

What else? Other types of assignments

It is possible to administer quizzes and proctored quizzes via WeBWork in addition to homework sets. These assignments can be given with a time limit (for example, 30 minutes to finish once you start). This type of assignment can also be used to restrict the location from which a student would take such a quiz, or to require a proctor to enter a password verifying the student’s identity. In this document, we have focused on the nuts and bolts of setting up homework assignments, but for more information on quizzes, please visit http://webwork.maa.org/wiki/Gateway_Tests_and_Quizzes . [NOTE: The 112A Competency Quizzes have been coded and are available for use. Contact the authors of this guide for more information.]

Customizing your WeBWork experience

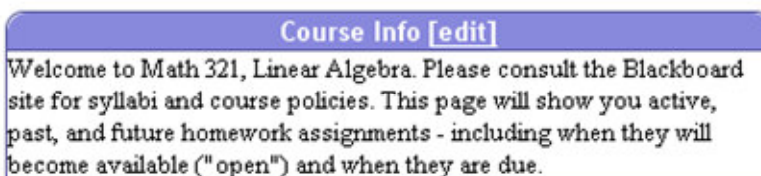
Changing the course info/set header/hardcopy header to fit your course

These three text files can be customized to reflect info about your specific course. The default files are set up to make it easy for you to fill in your own information. As such, they don't make much sense if left unchanged. To change course info, click on the "edit" link at the opening page of your WeBWork course, then make and save your desired changes in the course_info.txt file.

Default course info:



Customized:



The set and hardcopy headers print at the top of each assignment, either online or in the hardcopy printout. You can view and change these via the "edit Set Data" page of the Hmwk Set Editor.

Headers	Display Mode: <input type="button" value="None"/> <input type="button" value="Refresh Display"/>
Set Header Edit it View it	<input type="text" value="setHeaderSIUE_ct.pg"/> <input type="text" value="setHeaderSIUE_ct.pg"/>
Hardcopy Header Edit it View it	<input type="text" value="Use Default Header File"/>

The WeBWork student experience

Introducing your students to WeBWork

Some effort is required on the part of the students to learn how to navigate the system and enter their answers with correct mathematical notation. An Orientation to WeBWork problem set has been authored that can ease this transition. It is available by clicking on the SIUE button in the library browser and selecting “Orientation” from the list of SIUE problem sets. You can modify this set to fit the needs of your course.

Differences in the student WeBWork interface

The student view will have fewer menu options than the instructor’s view of WeBWork. It is possible for WeBWork to behave as if you were a specific student – this can be helpful if you are trying to troubleshoot from a distance.

Downloading hard copy homework sets

Students are able to download a pdf file of the assigned problems via a button on the entry page or at the top of a given homework assignment. They can then take this sheet with them to the Tutor Lab or MRA to get help.

Problems with problems – how to troubleshoot

Often, you may not discover the issue until the problems are in the hands of your students. You may be able to dig into the problem code to find the issue. If you are stuck, ask Adam Weyhaupt for assistance.

Common student complaints and how to address them

“I don’t know how to type this in.”

Provide a link to standard mathematical notation for WeBWork, such as http://webwork.maa.org/wiki/Mathematical_notation_recognized_by_WeBWork

“I typed the right thing, but the computer tells me I’m wrong.”

Check parentheses and other general syntax. This could also be an issue of environment – perhaps the student was trying to get WeBWork to calculate an amount using operations forbidden for a given problem. If you notice a mistake in a problem, please inform Adam or Cindy (and then mark the problem correct for all students).

“I turned it in at 12:01am and it was due at 11:59pm!”

Tough. At most, they could have missed only a few problems, because each problem is submitted one at a time (instead of the whole batch at once).

“Can you please give me credit for my answer?”

If the computer did not accept an answer you find worthy, you can dig into an individual problem set to give a single student or the whole class credit for a specific problem regardless of their answer. This process is described in the “Grading” section above. It is usually easier to just give the whole class credit, and this happens rarely so doesn’t usually upset the students.

“We haven’t learned the material for problem 6 yet.”

You can opt to delete a problem (erasing all student efforts) or to give everyone credit (“Mark correct” in the Hmwk Set Editor).

Communicating through WeBWork

The "Email instructor" button can be used by students to ask for help at any point during a problem set. WeBWork will send you an email detailing the question details and including the student's specific question/comment to you about a given problem.

Below is a sample of student feedback from WeBWork. Note the number of student attempts is given, as well as the random seed used to generate this student's version of the problem. (This is sometimes necessary for troubleshooting.) The feedback message from the student is shown below in bold.

From: "Abel Student" <astudent@siue.edu>
Date: October 5, 2009 10:45:30 PM CDT
To: adam.veyhaupt@gmail.com
Subject: [WWfeedback] course:CAS_MATH150__025_026_027_FA09 user:astudent set:ch2sec8_related_rates prob:9 sec: rec:

This message was automatically generated by the WeBWork system at <https://webwork.siu.edu/webwork2/>, in response to a request from [146.163.50.20:62264](https://webwork.siu.edu/webwork2/).

Click this link to see the page from which the user sent feedback:
https://webwork.siu.edu/webwork2/CAS_MATH150__025_026_027_FA09/ch2sec8_related_rates/9/?effectiveUser=astudent&showSolutions=&showOldAnswers=1&displayMode=images&showCorrectAnswers=&showHints=0

**** The feedback message: ****

when u take the derivative of $V=IR$ u get $V'=I'R$ ". there are no spots to input the givens I and R, when we did product rule with $I'R$ it came out wrong.

**** Data about the problem processor: ****

Display Mode: images

[...]

**** Data about the problem: ****

Problem ID: 9

Source file: Library/Rochester/setVmultivariable5ChainRule/[ur_vc_6_10.pg](#)

Value: 1

Max attempts unlimited

Random seed: 2705

Status: 0

Attempted: yes

Last answer:

AnSwEr1: -1

Number of correct attempts: 0

Number of incorrect attempts: 7

[...]

The student's feedback indicates a misunderstanding of the product rule, which can be pointed out via a short email reply to the student. It should be noted that the professor also took the opportunity to remind the student that the more work he can show in his email comment, the easier it will be for the instructor to provide timely help.

Useful Resources

General info on the WeBWork system

- <http://webwork.maa.org>
A detailed wiki with information for both students and instructors. Includes video tutorials for instructors.
- <http://webwork.maa.org/moodle/>
This site includes links to forums discussing various features of WeBWork.

Help for writing your own problems

- <http://webwork.maa.org/wiki/Category:Authors>
This page gives of links addressing a variety of tasks from general to specific.

Research on the impact of WeBWork on student learning

- http://www.maa.org/columns/launchings/launchings_04_09.html
An April 2009 column by David Bressoud, this piece gives a good intro to the WeBWork homework system and describes existing research on WeBWork's effect on student learning. Includes an annotated bibliography.

We hope this guide is useful to you! Please let Adam (aweyhau@siue.edu) or Cindy (cytraub@siue.edu) know if you have further questions.