Automatic Assessment and Feedback in First-Year Calculus

E-Learning Case Studies

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Introduction

E-learning for Calculus I: a web-based platform for

- self-paced student learning,
- on-line assessment, and
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Focus: the interplay of formative and summative assessment mechanisms

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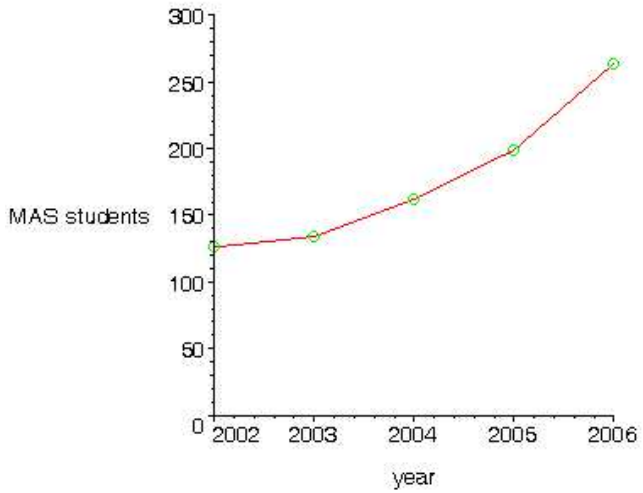

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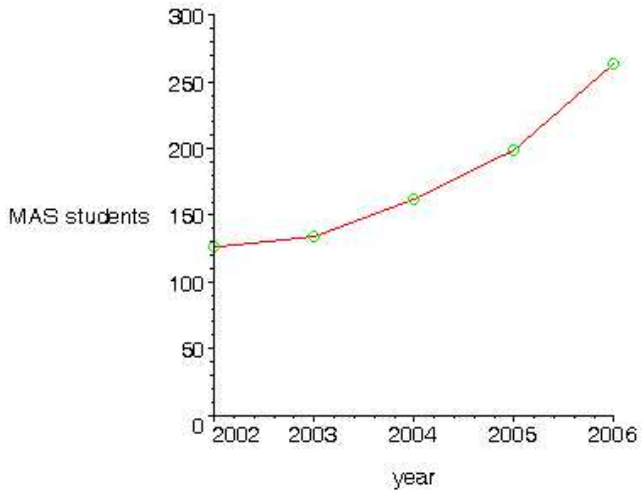

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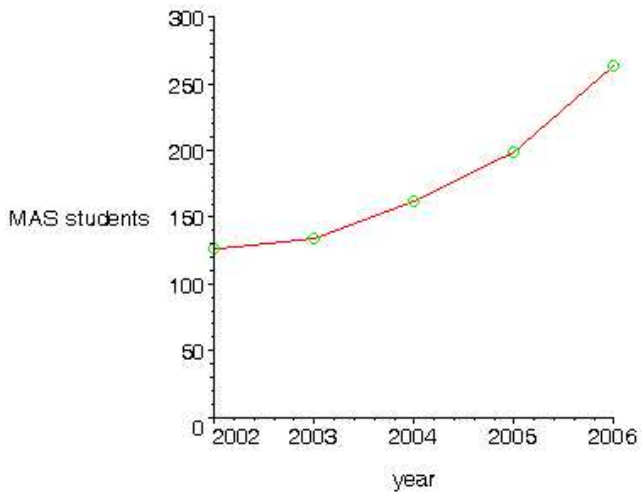

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Suitable for e-learning: Calculus I and Calculus II

Choice of Platform

Selection of Thomas' Calculus together with CourseCompass / MyMathLab (Pearson Education)

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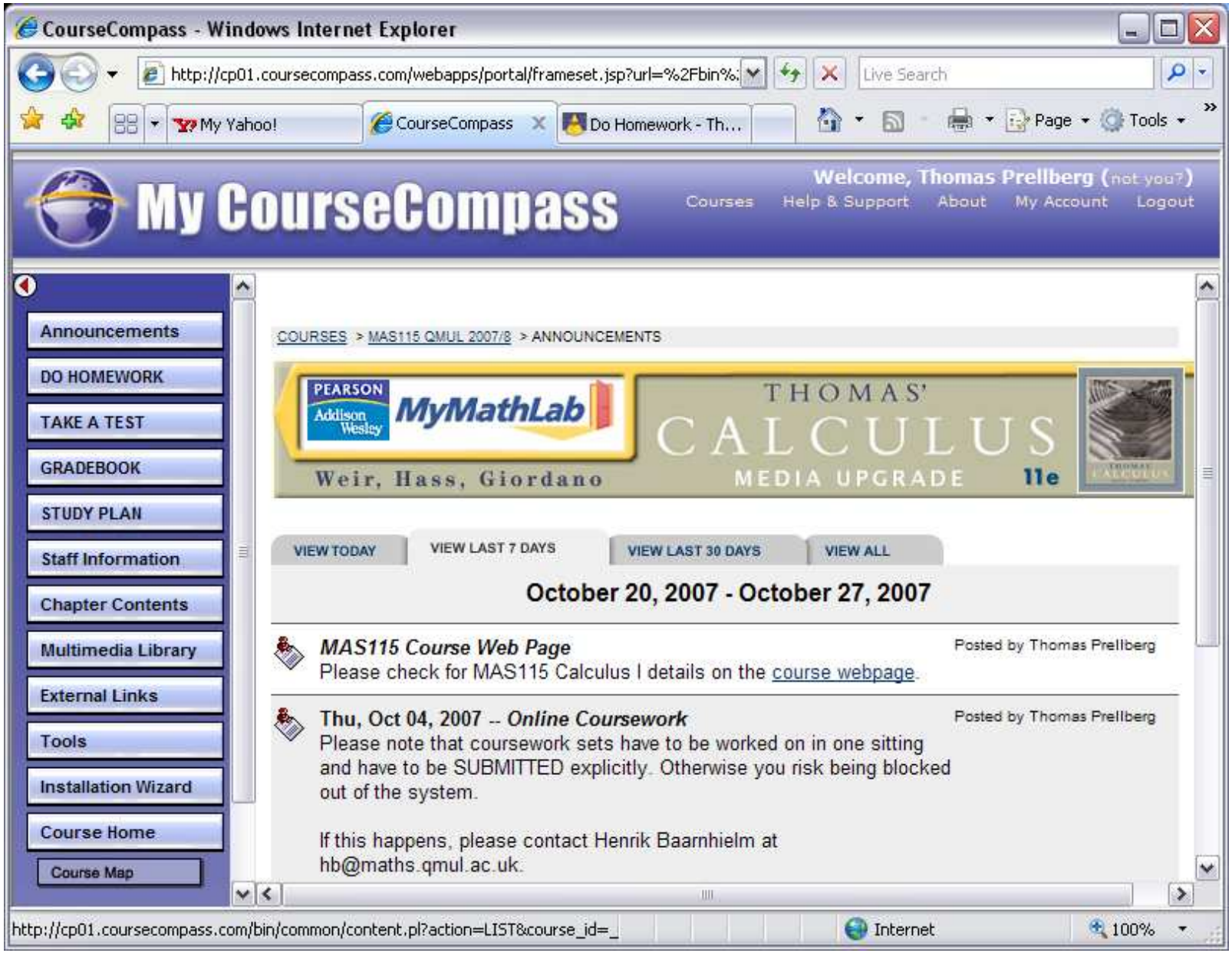
Similar products: Maple T.A., WileyPLUS with Webassign, ...

CourseCompass



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- Personalised study plan

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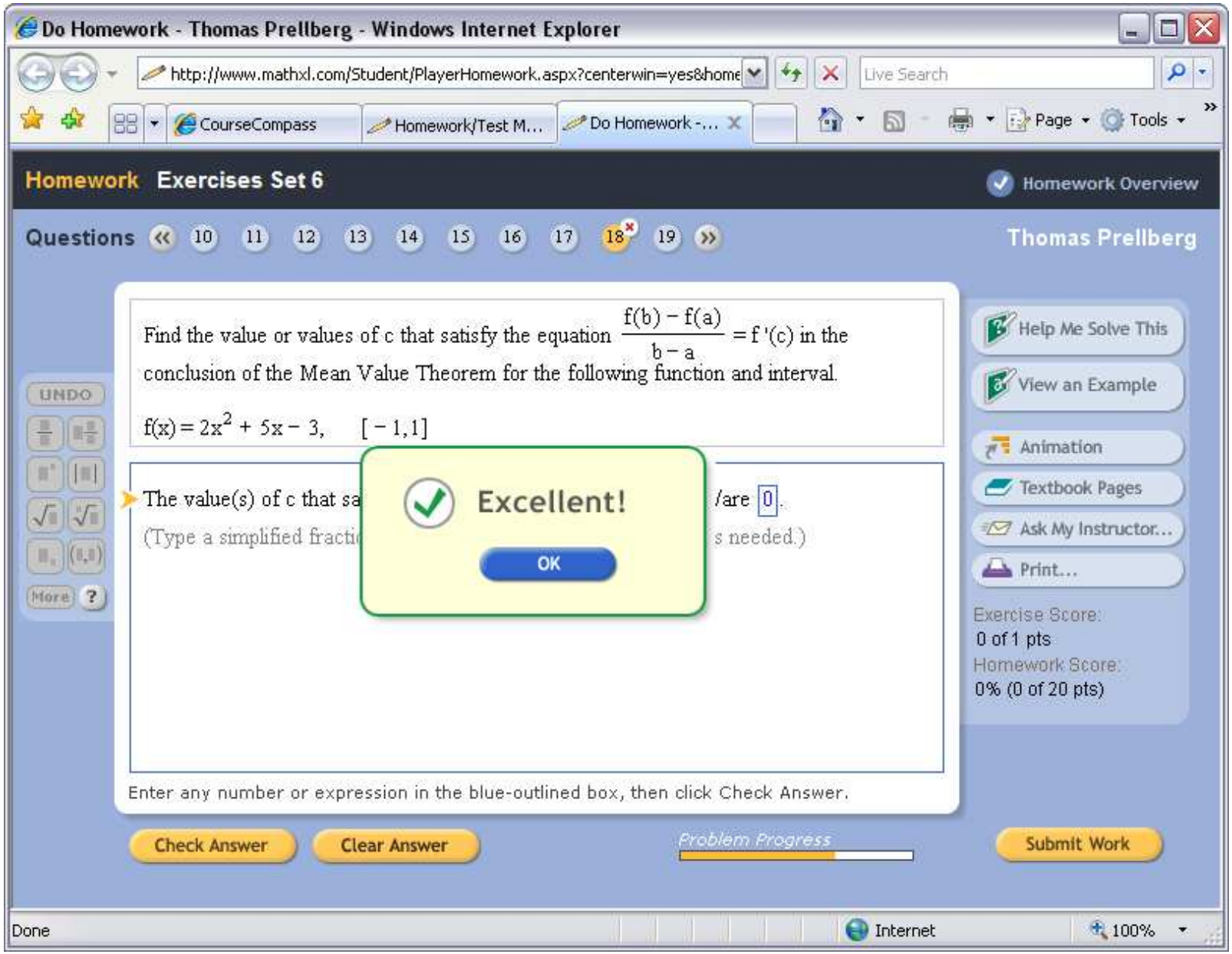
- You can also design your own questions

Homework environment: sample problem



Homework environment

Exercise-specific support and help

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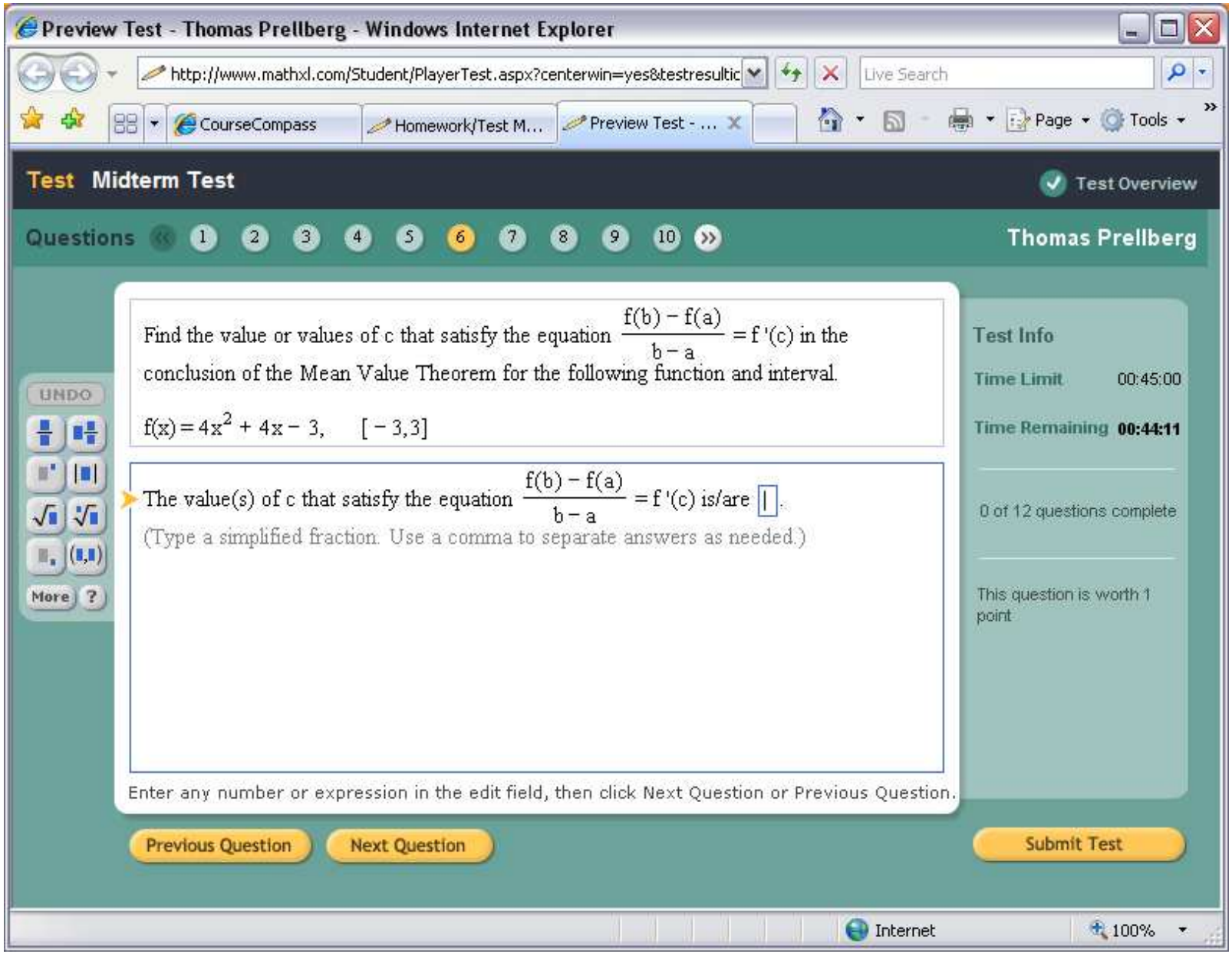
- "Ask my Instructor": enables the student to email the lecturer

Demonstration

Quiz/test environment: sample problem



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- scramble question order

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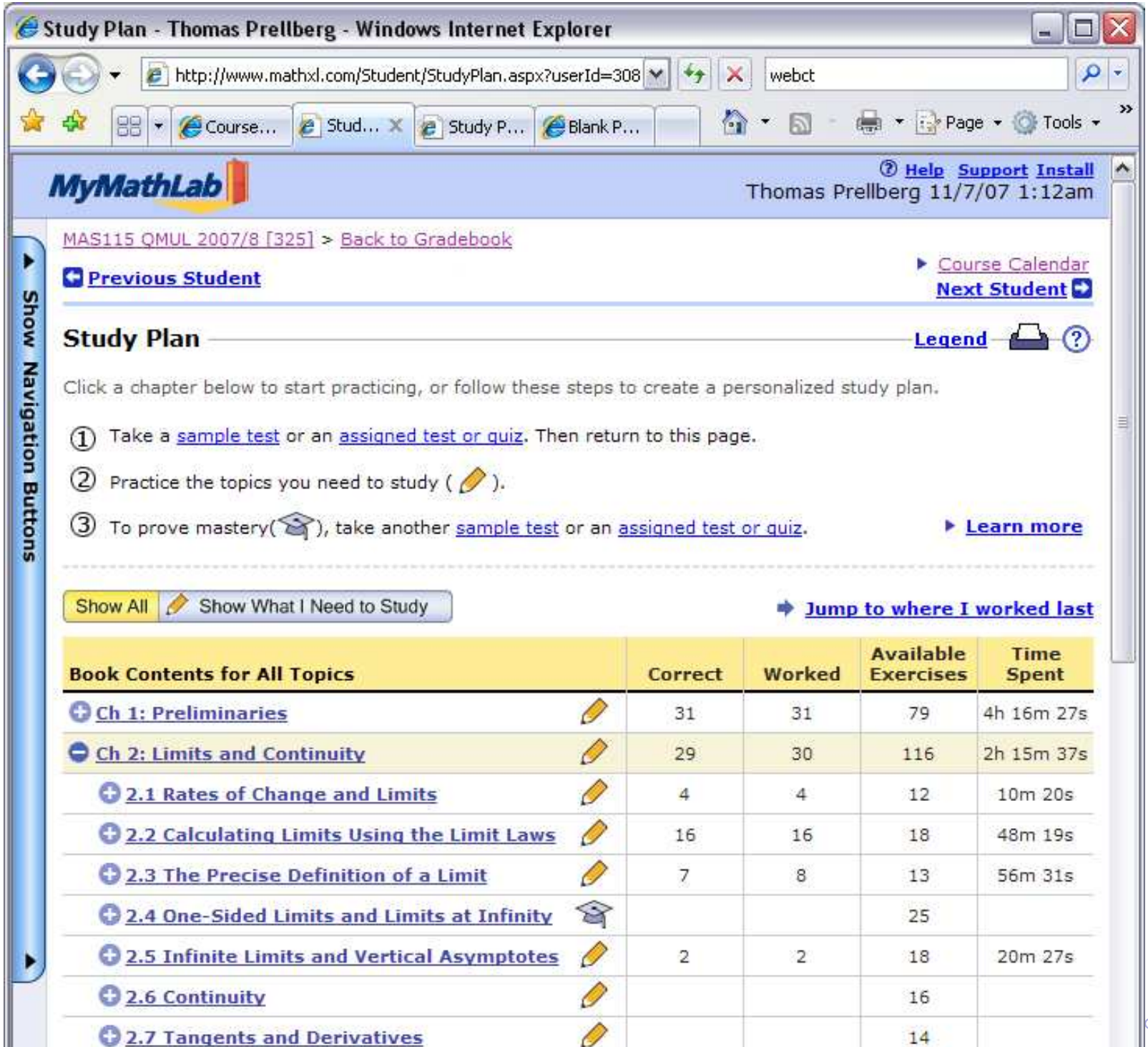
Study Plan - Thomas Prellberg - Windows Internet Explorer
http://www.mathxl.com/Student/StudyPlan.aspx?userId=308
webct
Course...
Stud...
Study P...
Blank P...
Page
Tools
MyMathLab
Help Support Install
Thomas Prellberg 11/7/07 1:12am
MAS115 QMUL 2007/8 [325] > Back to Gradebook
Previous Student
Course Calendar
Next Student
Show Navigation Buttons
Study Plan
Legend
Click a chapter below to start practicing, or follow these steps to create a personalized study plan.
① Take a sample test or an assigned test or quiz. Then return to this page.
② Practice the topics you need to study ( ).
③ To prove mastery( ), take another sample test or an assigned test or quiz.
Learn more
Show All
Show What I Need to Study
Jump to where I worked last
Book Contents for All Topics
Correct
Worked
Available Exercises
Time Spent
Ch 1: Preliminaries 31 31 79 4h 16m 27s
Ch 2: Limits and Continuity 29 30 116 2h 15m 37s
2.1 Rates of Change and Limits 4 4 12 10m 20s
2.2 Calculating Limits Using the Limit Laws 16 16 18 48m 19s
2.3 The Precise Definition of a Limit 7 8 13 56m 31s
2.4 One-Sided Limits and Limits at Infinity 25
2.5 Infinite Limits and Vertical Asymptotes 2 2 18 20m 27s
2.6 Continuity 16
2.7 Tangents and Derivatives 14

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- Only the final submission counts.

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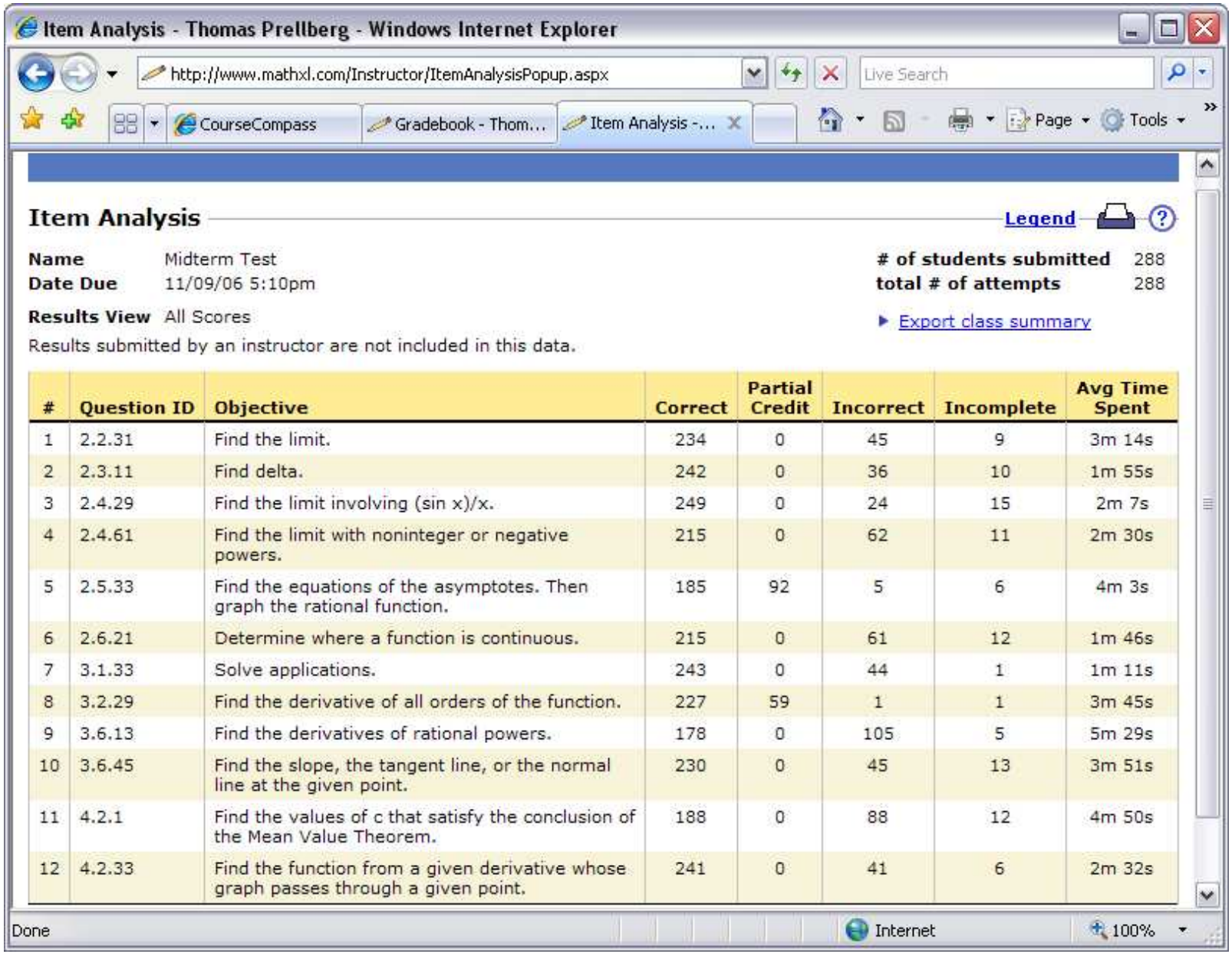
  - 50% of the questions involve material not suitable for online assessment: definitions, theorems, simple proofs, etc.
- Conventional exercise classes are used to prepare for these.

Data on Student Performance



Item Analysis - Thomas Prellberg - Windows Internet Explorer

http://www.mathxl.com/Instructor/ItemAnalysisPopup.aspx

CourseCompass | Gradebook - Thom... | Item Analysis -...

Item Analysis

Legend

Name Midterm Test
Date Due 11/09/06 5:10pm

# of students submitted 288
total # of attempts 288

Results View All Scores

Export class summary

Results submitted by an instructor are not included in this data.

#	Question ID	Objective	Correct	Partial Credit	Incorrect	Incomplete	Avg Time Spent
1	2.2.31	Find the limit.	234	0	45	9	3m 14s
2	2.3.11	Find delta.	242	0	36	10	1m 55s
3	2.4.29	Find the limit involving (sin x)/x.	249	0	24	15	2m 7s
4	2.4.61	Find the limit with noninteger or negative powers.	215	0	62	11	2m 30s
5	2.5.33	Find the equations of the asymptotes. Then graph the rational function.	185	92	5	6	4m 3s
6	2.6.21	Determine where a function is continuous.	215	0	61	12	1m 46s
7	3.1.33	Solve applications.	243	0	44	1	1m 11s
8	3.2.29	Find the derivative of all orders of the function.	227	59	1	1	3m 45s
9	3.6.13	Find the derivatives of rational powers.	178	0	105	5	5m 29s
10	3.6.45	Find the slope, the tangent line, or the normal line at the given point.	230	0	45	13	3m 51s
11	4.2.1	Find the values of c that satisfy the conclusion of the Mean Value Theorem.	188	0	88	12	4m 50s
12	4.2.33	Find the function from a given derivative whose graph passes through a given point.	241	0	41	6	2m 32s

Done | Internet | 100%

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  - ability to identify and respond to specific difficulties

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  - very useful to monitor student learning in a timely way
  - ability to identify and respond to specific difficulties
- Individual data on performance for each student
  - ability to see precisely when and for how long a student has been online: "Big brother is watching"

Demonstration

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The use of MyMathLab for Calculus has been a success.

- Usefulness of MyMathLab for other mathematics modules?
- Similar environments, e.g. MyStatLab for statistics modules?

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All this is relatively new, even in the US. Last October the American Mathematical Society solicited comments about online grading:

`http://firstyearmathematics.blogspot.com`