12-52
App-10/16/12
Info-11/6/12

Undergraduate Distance Education Review Form

Existing and Special Topics Course

Course: MATH125 Calculus I for Physics, Chemistry, and Mathematics

Received
OCT 2 2012
Liberal Studies

Instructor of Record: Dr. Frederick Adkins

Phone: 724-357-3790 **Email:** fadkins@iup.edu

Step One: Proposer

A. Provide a brief narrative rationale for each of the items, A1- A5.

These items are included in the attached appendix.

B. Submit to the department or its curriculum committee the responses to items A1-A5, the current official syllabus of record, along with the instructor developed online version of the syllabus, and the sample lesson. This lesson should clearly demonstrate how the distance education instructional format adequately assists students to meet a course objective(s) using online or distance technology. It should relate to one concrete topic area indicated on the syllabus.

Step Two: Departmental/Dean Approval

Recommendation: ☒ Positive (The objectives of this course can be met via distance education)

☐ Negative

Signature of Department Designee — Date: 9/26/12

Endorsed: Signature of College Dean — Date: 10/2/12

Forward form and supporting materials to Liberal Studies Office for consideration by the University-wide Undergraduate Curriculum Committee. Dual-level courses also require review by the University-wide Graduate Committee for graduate-level section.

Step Three: University-wide Undergraduate Curriculum Committee Approval

Recommendation: ☒ Positive (The objectives of this course can be met via distance education)

☐ Negative

RECEIVED
OCT 17 2012
ASSOCIATE PROVOST OFFICE

Gail S Sechrist — Signature of Committee Co-Chair — Date: 10/16/12

Forward form and supporting materials to the Provost within 30 calendar days after received by committee.

Step Four: Provost Approval

☑ Approved as distance education course ☐ Rejected as distance education course

Gerard W. Clemens 10/18/12

Signature of Provost Date

Forward form and supporting materials to Associate Provost.

Appendix: Required Materials and Documents

Step One: Proposer

A. Provide a brief narrative rationale for each of the items, A1- A5.

A1. How is the instructor qualified in the distance education delivery method as well as the discipline?

The instructor of record is Dr. Frederick Adkins. He has a Ph.D. in Applied Mathematical and Computational Sciences from The University of Iowa. In addition to having taught online versions of MATH115 and MATH121 more than 10 times since 2005, Dr. Adkins has been actively involved in distance education since 1999. In 1999, Dr. Adkins was selected for and participated in the IUP Instructional Design Center WebCT Development Stipend Program. This was a week-long intensive introduction to WebCT including the opportunity to build a WebCT course. Dr. Adkins used this experience to add supplemental WebCT based material to his MATH123 and MATH124 courses. In the following year, Dr. Adkins attended a workshop "CAPE— Distance Education / Videoconference Operator Training" which was held at IUP. This training focused on communication needs and operation of videoconference equipment.

In addition to directly teaching online classes, Dr. Adkins has had an active role in shaping the future of distance education in the Pennsylvania State System of Higher Education. From 2000-2004 he was the technical specialist for the PASSHE Center for Distance Education and the Keystone University Network. He provided software development and support for the State System's WebCT and Blackboard installations. From 2002-2004 he was a member (with Dr. Nick Kolb) of the planning and oversight team the "Keystone University Network Workgroup."

Through his involvement in statewide distance education activities, Dr. Adkins participated in the "EDU101: Online Instructor Certificate Course." This is an eCollege Online Course taken during 2001-2002 for training faculty to teach courses online.

Dr. Adkins has also participated in a variety of activities and conferences focusing on distance education including:

- SSHE Network Operations Center— MCU Videoconference Operator Training. October 10-11, 2000. A selected group of faculty and technical staff across the PASSHE participated in this two day training workshop on usage of videoconferencing multipoint control unit (MCU) bridge operation and distance education hardware.
- Blackboard Users Summit 2001, Washington, DC. April 5-6, 2001. This was a symposium sponsored by Blackboard to showcase online education.
- *Educause 2001 Conference. Indianapolis.* October 28-31, 2001. Educause is an organization with a dedication to serving the technology needs of higher education. I went to this conference with the specific purpose to meet with the Independent Blackboard Users Group.
- Blackboard Users Conference 2003, Baltimore, MD. February 25-27, 2003.
- Reviewer of the 2004 PASSHE Distance Education Program Investment Grants

Dr. Adkins has used and shared the skills he acquired through workshops and activities such as:

- Presenter at "Faculty Professional Development Day: Hands-on WebCT workshop," California University of Pennsylvania, May 2001.
- By supporting activities at "Emerging Educational Technologies Conference," Lock Haven University of Pennsylvania May 2000.
- Participant as a faculty consultant for PASSHE Online Learning Network RFP Vendor Interviews in Harrisburg (2001).

A2. How will each objective in the course be met using distance education technologies?
Course objectives and corresponding distance education implementation are given below:

Objective 1:
The student will be able to describe functions verbally, numerically, graphically, and algebraically and use them to model problems in the physical world.

The online environment uniquely ties technology to the learning process. Computer software will be used to aid students in graphing and exploring the properties of functions. Students also have the option of using a graphing calculator in addition to computer software. Modeling physical and natural science applications with mathematics is integrated throughout the course. Exercise sets for almost every section of the textbook include written homework exercises that ask the student to model real-world problems. Additionally, video-lecture content will cover application of calculus to exploration and modeling of natural and social science problems. Given a set of data, students will be expected model phenomena using the various functional representations. Solving problems such as these will enable students to see the relationship among the representations and assign mathematical meaning to information related to a variety of real-world situations. Students will be asked to verbalize functional patterns that they find and then write about these patterns and use mathematics to represent them. Students may model phenomena such as the size of a population, demand for a product, speed of a falling object, as well as many others. This will give students the opportunity to interpret, analyze, and use numerical data and graphs, and develop simple mathematical models to solve problems. Technology will be used to gain deeper insight into the phenomena and make predictions about future behavior.

Objective 2:
The student will be able to calculate limits by graphical, numerical, and analytic methods and determine when they fail to exist.

One of the roles of calculus is to enable students to uncover interesting features of functions without the need for technology. Occasionally, technology gives misleading results or hides important details regarding the graphical interpretation of functions. Students will use calculus to explore situations where the technology may not provide sufficient detail or when calculus indicates a more careful investigation is needed. Computer-based assignments will require students to make observations about and calculate limits using data tables, graphs, and limit laws. To provide students with an analytic understanding of the nature of limits, the technical definition will be introduced. Limits will also be used to make conclusions about the accuracy of mathematical models and assist in refining them. Technology can be used to verify observations and exhibit the correspondence between geometric and analytic information.

Objective 3:
The student will understand continuity geometrically and analytically through the use of limits, and classify points of discontinuity.

Problems concerning continuity are used to develop deductive reasoning and critical thinking skills. Understanding and using the concept of continuity will require that students translate an intuitive or graphical idea to one expressed analytically in terms of limits. The ability of computers to animate the limit process and graphically display the connection to continuity makes the computer-enhanced environment of distance education a conduit for improved student learning. The importance of continuity throughout the sciences is explained, as it is essential in proving many important theorems in mathematics. As an illustration, the Intermediate Value Theorem is introduced along with several of its applications. Students can immediately identify the importance of continuity across various disciplines. Technology can be used to assign geometric meaning to analytic results concerning continuity. Understanding these technical results from an intuitive perspective will increase the students' confidence and ability in using mathematics.

Objective 4 :
The student will calculate and interpret derivatives as limits, slopes of tangent lines, and rates of change.

The idea of limit is central to understanding calculus. In both derivative and integral calculations, students will use the computer interface to model approximations to tangents to functions and area under curves. These models will use successively better approximations (hence the limit process). Students will thus be able to visualize the limit process and see its effect on calculating the derivative and the Riemann sum. Students will be exploring the various interpretations of the derivative, measuring how one quantity changes in response to a change in another quantity. Through this exploration, the relationship between slopes of lines, rates of change, and limits is reinforced. The concept of the derivative will be used to solve geometric problems, such as curve sketching, and to convert written applied problems into mathematical models. Students will gain a deeper understanding of mathematics, as the

relationship between limits, continuity, and differentiability is exhibited. Integrating these key concepts will increase confidence and ability in understanding mathematics.

Objective 5:
The student will be able to calculate derivatives of algebraic and transcendental functions using the sum, power, product, quotient, and chain rules.

In addition to the topics described in Objective 4, assignments will be designed so that students will learn the various differentiation formulas and identify the types of functions to which they apply. Students will practice recognizing the structure of algebraic expressions related to the rules of calculus. In exercise sets, students will be asked to self-discover the rules by reviewing a series of specific examples. They will then validate or improve their rules by reviewing additional examples. This material is also presented in video-lecture content and textbook readings.

Objective 6:
The student will use derivatives to sketch curves.

Methods utilized for curve sketching will be used to identify important characteristics of mathematical models generated by applied problems, such as finding extreme values to solve optimization problems. Computer animations and video lectures will illustrate the process for using derivatives to sketch curves. Students will practice via computer-enable homework questions.

Objective 7:
The student will express definite integrals as the area under a curve and the limit of Riemann sums.
The problem of rigorously defining area under general curves is presented as part of video lectures. The ability of computers to animate the limit process and graphically display the connection of area to Riemann sum makes the computer-enhanced environment of distance education a conduit for improved student learning. As an area-based concept dating back to the nineteenth century, the definite integral is motivated geometrically and historically. Students will use the basic idea of calculating the area of rectangles to obtain approximations for the area under continuous functions over appropriate regions. Analytic methods are then introduced through the use of limits to formally define the concept of area and definite integrals. Technology may be used to calculate the error between the approximations and actual value, and show how this error becomes smaller as the approximations get better. Demonstrations such as these enable the student to link theory with practice and application.

Objective 8:
The student will calculate definite and indefinite integrals using the Fundamental Theorem of Calculus and apply the appropriate integration formulas and techniques.

Through the interactive online exercises, students will be required to symbolically enter results as they calculate derivatives and integrals. These solutions will be automatically checked by computer software. The online software checks for common mistakes and provides students feedback prompts to correct any errors. Through written homework assignments, application problems, discussion board postings, and examination questions students will be asked to provide written responses that interpret the meaning of their calculations. An historical perspective of the subject will be presented as the connection between differential and integral calculus is established. The Fundamental Theorem of Calculus (FTC) is shown to have developed calculus into a systematic mathematical method. Assignments will require the application of the FTC to evaluate definite integrals and represent antiderivatives. Students will also be expected to use antidifferentiation formulas to express indefinite integrals, and apply the substitution method when appropriate. Integrals will also be used in a variety of applications to model mathematical, physical and economic situations. In particular, examples include calculating the average value of a function, determining the distance traveled by a particle along a line, and calculating accumulated changes.

Objective 9:
The student will convert written applied problems from the physical, natural and social sciences into mathematical models and solve these using methods of differential calculus.

Applied problems will be converted into mathematical models and solved using differential calculus. This includes the concepts of optimization and related rates, in which the student is required to express a written problem mathematically. To do so, the student must have a thorough understanding of the problem, define functions to model the phenomena, and apply the methods of differential calculus to find extreme values. These techniques are shown to have applications in business and economics, physics, biology, and other areas at the instructor's discretion. Exercise sets for almost every section of the textbook include written homework exercises that ask the student to model real-

world problems. Additionally, video-lecture content will cover application of calculus to exploration and modeling of physical, natural, and social science problems.

Objective 10:
The student will use technology appropriately as an aid to problem solving.

Building skills on use of technology is an inherent part of the student experience in a distance education environment. Technology is useful for reinforcement and clarification of many topics in Calculus. For examples refer to Objectives 1, 2, 3 and 7. One of the Mathematics Departments overall objectives is to improve students' skills in utilizing technological tools for quantitative analysis – a distance education environment is a natural fit for this outcome.

Objective 11:
The student will communicate mathematical ideas and solutions through well-written sentences.

This skill is developed as objectives 1 through 10 are accomplished. One of the Mathematics Department's overall objectives is to improve students' skills in communicating outcomes of quantitative analysis. Students are required on a weekly basis to contribute and respond to discussion board postings tied to course content, providing writing practice. The course concludes with a final project and a final exam. These materials are submitted in hard copy to the instructor providing practice and evidence of the student's solid set of skills and conceptual framework developed though the course.

A3. How will instructor-student and student-student, if applicable, interaction take place?
Material for the online course includes interactive exercises that use computer generated prompts to address student questions and give hints for subsequent steps. Additionally, there are video mini-lectures, audio clips annotating step-by-step solutions, and online try-it-yourself exercises. It is anticipated that a hyper-linked online textbook will be used to direct students to read and review necessary textbook pages. Instructor will provide interactive assistance during "office hours" via use of web-based videoconferencing software, use of chat rooms, and by telephone. Instructor-student interaction will also occur through email, discussion board postings, and by exchange of documents including fax, electronic, and postal mail.

Students are required on a weekly basis to contribute and respond to discussion board postings tied to course content. This is the foundation for the student-student community. Students will also be encouraged to exchange email addresses for additional peer collaboration.

A4. How will student achievement be evaluated?
Students will be required to complete written homework assignments, take online quizzes, and complete examinations over chapters of material. Students will have a project to complete at the end of the semester that uses content spanning the entire course.

A5. How will academic honesty for tests and assignments be addressed?
Written homework exercises will be submitted by either US Postal Mail, scanning and emailing, or by fax. Homework should be the student's own work (verified by handwriting consistency), but students are allowed to seek help from a qualified tutor. Student discussion board postings are reviewed and reply comments are posted online with expected follow-up email messages sent to and from the instructor. This interaction allows instructor to gauge originality of student work. Online quiz and exam materials are algorithmically generated so each student receives different numbers in similar type problems. As the students have both time limitations and receive different problems this helps eliminate cheating. Additionally, proctored testing services are intended for the final exam.

C. Submit to the department or its curriculum committee the responses to items A1-A5, the current official syllabus of record, along with the instructor developed online version of the syllabus, and the sample lesson. This lesson should clearly demonstrate how the distance education instructional format adequately assists students to meet a course objective(s) using online or distance technology. It should relate to one concrete topic area indicated on the syllabus.

These items are presented on subsequent pages.

B1. Current Official Syllabus of Record

I. Catalog Description

MATH 125 Calculus I/Physics, Chemistry, Mathematics

3 class hours
0 lab hours
3 credits
3c-0l-3cr

Prerequisite: MATH 110 or equivalent placement (Algebra, geometry and trigonometry.)

The first of a three semester sequence for math and science majors covering the theory of calculus and its application in problem solving. Topics include: functions, limits, continuity, derivatives, applications of derivative, integrals and applications of the integral. (Trigonometric, exponential and logarithmic functions are included throughout the course.)

II. Course Outcomes and Assessment: Expected Undergraduate Student Learning Outcomes - EUSLO

Objective 1:
The student will be able to describe functions verbally, numerically, graphically, and algebraically and use them to model problems in the physical world.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Given a set of data, students will be expected model phenomena using the various functional representations. Solving problems such as these will enable students to see the relationship among the representations and assign mathematical meaning to information related to a variety of real-world situations. Students may model phenomena such as the size of a population, demand for a product, speed of a falling object, as well as many others. This will give students the opportunity to interpret, analyze, and use numerical data and graphs, and develop simple mathematical models to solve problems. Technology may be used to gain deeper insight into the phenomena and make predictions about future behavior.

Objective 2:
The student will be able to calculate limits by graphical, numerical, and analytic methods and determine when they fail to exist.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Assignments will require students to make observations about and calculate limits using data tables, graphs, and limit laws. To provide students with an analytic understanding of the nature of limits, the technical definition will be introduced. Limits will also be used to make conclusions about the accuracy of mathematical models and assist in refining them. Technology can be used to verify observations and exhibit the correspondence between geometric and analytic information.

Objective 3:
The student will understand continuity geometrically and analytically through the use of limits, and classify points of discontinuity.

Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Problems concerning continuity are used to develop deductive reasoning and critical thinking skills. Understanding and using the concept of continuity will require that students translate an intuitive or graphical idea to one expressed analytically in terms of limits. The importance of continuity throughout the sciences is explained, as it is essential in proving many important theorems in mathematics. As an illustration, the Intermediate Value Theorem is introduced along with several of its applications. Students can immediately identify the importance of continuity across various disciplines. Technology can be used to assign geometric meaning to analytic results concerning continuity. Understanding these technical results from an intuitive perspective will increase the students' confidence and ability in using mathematics.

Objective 4 :
The student will calculate and interpret derivatives as limits, slopes of tangent lines, and rates of change.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Students will be exploring the various interpretations of the derivative, measuring how one quantity changes in response to a change in another quantity. Through this exploration, the relationship between slopes of lines, rates of change, and limits is reinforced. The concept of the derivative will be used to solve geometric problems, such as curve sketching, and to convert written applied problems into mathematical models. Students will gain a deeper understanding of mathematics, as the relationship between limits, continuity, and differentiability is exhibited. Integrating these key concepts will increase confidence and ability in understanding mathematics.

Objective 5:
The student will be able to calculate derivatives of algebraic and transcendental functions using the sum, power, product, quotient, and chain rules.
Expected Student Learning Outcome 2:
Empowered Learners
Rationale:
In addition to the topics described in Objective 4, assignments will be designed so that students will learn the various differentiation formulas and identify the types of functions to which they apply.

Objective 6:
The student will use derivatives to sketch curves.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Methods utilized for curve sketching will be used to identify important characteristics of mathematical models generated by applied problems, such as finding extreme values to solve optimization problems.

Objective 7:
The student will express definite integrals as the area under a curve and the limit of Riemann sums.

Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
The problem of rigorously defining area under general curves is presented. As an area-based concept dating back to the nineteenth century, the definite integral is motivated geometrically and historically. Students will use the basic idea of calculating the area of rectangles to obtain approximations for the area under continuous functions over appropriate regions. Analytic methods are then introduced through the use of limits to formally define the concept of area and definite integrals. Technology may be used to calculate the error between the approximations and actual value, and show how this error becomes smaller as the approximations get better. Demonstrations such as these enable the student to link theory with practice and application.

Objective 8:
The student will calculate definite and indefinite integrals using the Fundamental Theorem of Calculus and apply the appropriate integration formulas and techniques.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
An historical perspective of the subject will be presented as the connection between differential and integral calculus is established. The Fundamental Theorem of Calculus (FTC) is shown to have developed calculus into a systematic mathematical method. Assignments will require the application of the FTC to evaluate definite integrals and represent antiderivatives. Students will also be expected to use antidifferentiation formulas to express indefinite integrals, and apply the substitution method when appropriate. Integrals will also be used in a variety of applications to model mathematical, physical and economic situations. In particular, calculating the average value of a function, determining the distance traveled by a particle along a line, and calculating accumulated changes.

Objective 9:
The student will convert written applied problems from the physical, natural and social sciences into mathematical models and solve these using methods of differential calculus.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
Applied problems will be converted into mathematical models and solved using differential calculus. This includes the concepts of optimization and related rates, in which the student is required to express a written problem mathematically. To do so, the student must have a thorough understanding of the problem, define functions to model the phenomena, and apply the methods of differential calculus to find extreme values. These techniques are shown to have applications in business and economics, physics, biology, and/or other areas at the instructor's discretion.

Objective 10:
The student will use technology appropriately as an aid to problem solving.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:

Technology is useful for reinforcement and clarification of many topics in Calculus. For examples refer to Objectives 1, 2, 3 and 7. One of the Mathematics Departments overall objectives is to improve students' skills in utilizing technological tools for quantitative analysis.

Objective 11:
The student will communicate mathematical ideas and solutions through well-written sentences.
Expected Student Learning Outcomes 1 and 2:
Informed and Empowered Learners
Rationale:
This skill is developed as objectives 1 through 10 are accomplished. One of the Mathematics Departments overall objectives is to improve students' skills in communicating outcomes of quantitative analysis.

III. Detailed Course Outline

A. Review and Overview
   1. Functions and Models (0.5 class)
   2. Overview of Calculus (0.5 class)

B. Limits and Derivatives
   1. The Tangent and Velocity Problems (1 class)
   2. The Limit of a Function (1 class)
   3. Calculating Limits Using the Limit Laws (1.5 classes)
   4. Continuity (1 class)
   5. Limits Involving Infinity (1 class)
   6. Tangents, Velocities, and Rates of Change (1 class)
   7. Derivatives (0.5 class)
   8. The Derivative as a Function (1 class)
   9. What Does f' Say about f? (1 class)

C. Differentiation Rules
   1. Derivatives of Polynomials and Exponential Functions (1 class)
   2. The Product and Quotient Rules (1 class)
   3. Rates of Change in the Natural Sciences (1 class)
   4. Derivatives of Trigonometric Functions (1 class)
   5. The Chain Rule (1.5 classes)
   6. Implicit Differentiation (1.5 classes)
   7. Derivatives of Logarithmic Functions (1 class)
   8. Approximations, Differentials and Newton's Method (1 class)

D. Applications of Differentiation
   1. Related Rates (2 classes)
   2. Maximum and Minimum Values (1 class)
   3. Derivatives and the Shapes of Curves (1.5 classes)
   4. Graphing with Calculus and Calculators (1.5 classes)
   5. Indeterminate Forms and l'Hospital's Rule (1 class)
   6. Optimization Problems (2 classes)
   7. Antiderivatives (1 class)

E. Integrals
   1. Areas and Distances (1 class)
   2. The Definite Integral (1 class)

3. Evaluating Definite Integrals (1 class)
4. The Fundamental Theorem of Calculus (1.5 classes)
5. The Substitution Rule (1.5 classes)

F. Applications of Integration
1. More about Areas (1 class)
2. Volumes (1 class)

Additional class time for review periods and examinations (5 classes)

Total classes: 42

IV. Evaluation Methods

The final grade for the course will be determined as follows:

Homework	15%
Quizzes	10%
3 exams	55%
Comprehensive Final	20%

V. Example Grading Scale

90% - 100%	A
80% - 89%	B
70%-79%	C
60% - 69%	D
Below 60%	F

VI. Undergraduate Attendance Policy

Although there is no formal attendance policy for this class, student learning is enhanced by regular attendance and participation in class discussions.

[Note: It is recommended that an attendance policy be developed by individual faculty and included in student syllabi. (See undergraduate catalog for Undergraduate Course Attendance Policy.)]

VII. Required Textbooks, Supplemental Books and Readings

Textbook
Stewart, J., *Essential Calculus, Early Transcendentals*, Thompson Brooks/Cole, 2007.
Coverage: Chapters 1-5.

Supplemental Readings
Instructors are encouraged to select and assign a set of readings from the following or to utilize an appropriate supplemental article.
Dudley, U., *Readings for Calculus*, MAA Notes Volume 31, The Mathematical Association of America, 1993.

VIII. Special Resource Requirements

Students should have access to a calculator with graphical and symbolic capabilities.

IX. Bibliography

Anton, H., Bivens, I., and Davis, S., *Calculus: Early Transcendentals, Single and Multivariable*, 8th Edition, John Wiley & Sons, 2005.

Briggs, W. and Cochran, L. *Calculus: Early Transcendentals*, 1st Edition, Addison-Wesley, 2010.

Varberg, D., Purcell, E., and Rigdon, S., *Calculus*, 9th Edition, Prentice-Hall, 2006.

B2. Instructor syllabus:

MATH 125 Calculus I/Physics, Chemistry, Mathematics

Section 801 - 3 credits

Instructor:

Dr. Frederick Adkins
212 Stright Hall
Indiana University of Pennsylvania
Indiana, PA 15705
Work Phone: (724)357-3790
Home Phone: (724)349-7346 (please no calls after 9:00pm)
Email: fadkins@iup.edu

Description (From Catalog):

Prerequisite: MATH 110 or equivalent placement (Algebra, geometry and trigonometry.)

The first of a three semester sequence for math and science majors covering the theory of calculus and its application in problem solving. Topics include: functions, limits, continuity, derivatives, applications of derivative, integrals and applications of the integral. (Trigonometric, exponential and logarithmic functions are included throughout the course.)

Required Textbook:

Calculus for Scientists and Engineers: Early Transcendentals, by Briggs, Cochran, Gillett, & Schulz.
Pearson Publishing, First Edition (ISBN:0321785371)
Access to MyMathLab is required (separate ISBN: 032119991X), use course ID: adkins21333
For more details on the text, see: http://www.math.iup.edu/math125/book/

Technology:

Students will need to install free plugins for MathXL and the Mathematica CDF player available at:
http://www.mathxl.com/info/wizard.asp?bookCode=cwa8l&mml=yes
Also from this site, you will need to download software for Adobe Acrobat Reader, Macromedia Flash Player, Mathematica Player, RealPlayer, and QuickTime Player unless you already have this software. There may be additional plugins required depending on your computer's operating system.

Students should also have access to software similar to Microsoft Word and Excel.

Evaluation Methods:

The final grade will be determined as follows:

Grade	Weighted Percentage of Points Earned
A	90% -- 100%
B	80%-- 89%
C	70%-- 79%
D	60%-- 69%
F	below -- 60%

Your points total and grade is composed of:

7 Chapter Quizzes (7% of your grade each)	49%
Comprehensive final (on last day of class)	20%
Discussion Questions / Responses (1% each chapter)	7%
Computer Based Homework Exercises	17%
Pencil and Paper Homework Journal	7%

Course Outline

A. Review and Overview
   1. Functions and Models (0.5 class)
   2. Overview of Calculus (0.5 class)

B. Limits and Derivatives
   1. The Tangent and Velocity Problems (1 class)
   2. The Limit of a Function (1 class)
   3. Calculating Limits Using the Limit Laws (1.5 classes)
   4. Continuity (1 class)
   5. Limits Involving Infinity (1 class)
   6. Tangents, Velocities, and Rates of Change (1 class)
   7. Derivatives (0.5 class)
   8. The Derivative as a Function (1 class)
   9. What Does f' Say about f? (1 class)

C. Differentiation Rules
   1. Derivatives of Polynomials and Exponential Functions (1 class)
   2. The Product and Quotient Rules (1 class)
   3. Rates of Change in the Natural Sciences (1 class)
   4. Derivatives of Trigonometric Functions (1 class)
   5. The Chain Rule (1.5 classes)
   6. Implicit Differentiation (1.5 classes)
   7. Derivatives of Logarithmic Functions (1 class)
   8. Approximations, Differentials and Newton's Method (1 class)

D. Applications of Differentiation
   1. Related Rates (2 classes)
   2. Maximum and Minimum Values (1 class)
   3. Derivatives and the Shapes of Curves (1.5 classes)
   4. Graphing with Calculus and Calculators (1.5 classes)
   5. Indeterminate Forms and l'Hospital's Rule (1 class)
   6. Optimization Problems (2 classes)
   7. Antiderivatives (1 class)

E. Integrals
   1. Areas and Distances (1 class)
   2. The Definite Integral (1 class)
   3. Evaluating Definite Integrals (1 class)
   4. The Fundamental Theorem of Calculus (1.5 classes)
   5. The Substitution Rule (1.5 classes)

F. Applications of Integration
   1. More about Areas (1 class)
   2. Volumes (1 class)

Additional class time for review periods and examinations (5 classes)

Expectations:

I expect that you:

- Take responsibility for your own learning.
- Complete homework as indicated and in the manner described.
- Read the assigned material in addition to completing the exercises.
- Keep pace with the material-- this requires working on a daily basis.
- Seek assistance when difficulty arises.
- Take notes when appropriate and actively participate in web-based classroom activities.

You can expect from me:

- Assistance during posted office hours or by appointment.
- Timely return of materials.
- Clarity of my expectations and intentions.
- Fairness and reasonableness.

I am willing to help you in any way I can to succeed in this course, but I also expect you to be working hard toward the same goal.

Recommendations:

As the semester progresses you will develop habits as to how you study and do your work for your classes. It is important to begin the semester in the way you would like to finish it; consistent work and time spent on material as it is covered will dramatically increase your understanding, ability to keep pace with the course, and (from a student's perspective) should save time when compared to trying to catch-up and cram at the end of a semester.

Even though this is a web-based class, you should keep a notebook just like you would in a classroom lecture-based class. You should read the textbook. You should also be asking yourself questions like "is this clear to me?" or "do I need to see more examples of this?" as you are going through the online material. These are the types of questions you might be asked by a traditional classroom instructor—in a web-based class you need to *monitor your own learning* and *seek additional help when needed.*

This is Part I of the official syllabus. Be sure to print and read Parts II and III which provide more details about what you should be doing to be successful in this online class.

Syllabus Part II
Tips for Success in MATH 125 Online!

If this were a regular classroom course it would meet 4 days a week for 15 weeks and have 50 minutes of class time each day plus the necessary time (1-3 hours per day) to do homework. This is 60 class periods plus at least 60 hours of homework, for a total of at least 120 hours. In an online class, all the time is really "home"work.

Part of the reason to take an online class is flexibility of choosing your own hours. Some students will take more, some less, but you need to **set a regular time when you can work about two hours of time on this class each day.**

Tip 1) Understand how you are being evaluated.

7 Chapter Quizzes (7% of your grade each)	49%
Comprehensive final (on last day of class)	20%
Discussion Questions / Responses (1% each week)	7%
Computer Based Homework Exercises	17%
Pencil and Paper Homework Journal	7%

Tip 2) For the pencil and paper homework exercises you should be keeping a hand-written journal of the work you do throughout the semester. The course web site and "Part III" of the syllabus lists these end of the section textbook exercises.

You should be completing these pencil and paper exercises in addition to the computer-based online homework exercises. It makes sense that more practice on homework exercises will improve your performance on chapter quizzes.

YOU MUST SHOW YOUR WORK WITH DETAIL TO GET CREDIT!

You can choose to hold onto the pencil and paper exercises and submit them with your final exam, or you can mail or drop off the exercises from the first half of the class at the end of October. I will review and return these. In order to receive credit you need to postmark your pencil and paper journal with your final exam within 2 business days of December 11. Mail to: Dr. Frederick Adkins, Mathematics Dept, Indiana University of Pennsylvania, Indiana, PA 15705. If you ask for the "Media Mail" rate for your notebook, it will cost less. If you live close to IUP, you can also drop your journal off at the Math Department Office STR233.

Tip 3) Be responsible for your own learning. Only you will know if you do not understand the material. I will be able to review your comprehension via your quiz and exam grades, but that is too late. You need to deal with problems/difficulties as they arise. You need to determine when some concept or type of problem is not clear to you and then follow-up on this by seeking a solution to your question. There are a variety of resources: reading the textbook, viewing video lectures online, finding online computer exercises with the 'help me solve this' feature, contacting the tutor center (see Tip 7), or email/phone to the instructor.

Tip 4) Many students make the mistake in a regular classroom college course of thinking that they should work alone to master the material. Of course the actual graded work (materials turned in and taking of exams/quizzes) needs to be your own unique effort. However, I encourage you to seek assistance in the form of tutoring and group interaction. One might think that this is impossible in an online setting, but I am going to have a question/answer web-based bulletin

board/discussion list. You will see from the syllabus that you are required to post at least one **meaningful** question *each week* and contribute responses or answers to at least two questions *each week.* Questions can be about content (like "I do not understand how to evaluate the limit of a fraction when the denominator is zero") or problems (like "How can you evaluate $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$). Responses should include specific reference to the solution such as a page number or a web link or your personal solution technique. Postings like "I don't understand this either" are appropriate, but do not count toward your required postings as either your question or a response. Questions you write about in your journal for which you cannot find an answer on your own are OK for posting on the discussion list.

Tip 5) Know and follow the progress deadlines:

Quizzes are computer generated and will be available for specific dates throughout the semester. The seven quizzes cover material from about one chapter each as shown in the table below. You should try to keep pace with the material as shown in the table. You should be completing approximately one quiz per week. In order to allow you to get up to speed, the first quiz will be available until September 14th. However, you should be completing the quizzes *earlier* during the weekly dates shown. Quizzes will NOT be available for any reason after the "Must Take Quiz by Date." This is to keep you on pace to complete the course by December 10th.

You are supposed to take each quiz only ONCE. The system has the option to take the quiz a "second" time. This second chance is only to be used in case of computer problems. In the event of computer malfunction, power outage, etc. the quiz software should allow you to login again and continue the quiz where you stopped. In the event that a partially completed quiz is not saved you should utilize the "second" quiz.

Essentially you need to be covering a little more than a chapter every two weeks. Here is the suggested schedule:

August -December --- Section 801:

Week Number	1-2	3-4	5-6	7-8	9-10	11-12	13-15
Dates of Week (Mon-Sun.)	8/25-9/7	9/8-9/21	9/22-10/5	10/6-10/19	10/20-11/2	11/3-11/16	11/17-12/8
Material to Learn	Ch1	Ch 2	Ch 3	Ch 4	Ch 5	Parts of Ch 6	7.1-7.2
Must Take Quiz by Date	9/14	10/12	10/12	11/9	11/9	12/7	12/10 Also: Final Exam on 12/10-12/12

Tip 6) There is a four step process you should use when covering material from each section of the textbook.

Step 1: Each day you work on content in this course you should start in the "**Lessons/Tasks**" section for the chapter that you are working on.

Step 2: After completing the instructional material indicated in "Lessons/Tasks" for a section of the book, you should **read over that section in the textbook.**

Step 3: Next you should go to "**Online Homework**" and complete the problems for that section.

The "Online Homework" problems generally have built-in feedback and additional opportunities to help you learn the content better. You should be using the "View An Example", "Help Me Solve This", "Video", "Animation", and "Textbook Pages" features displayed in each problem.

Step 4: Once you have mastered the "Online Homework" exercises, **do the assigned pencil & paper homework problem in your journal.** Make sure you label and date each set and check your answers with the odd numbered solutions in the back of the textbook.

Tip 7) Know what resources are available to help you.

Student Technical Support and Phone Tutoring
For MyMathLab Website Usage and Installation Tech Support:
Monday-Friday
9 AM - 6 PM Eastern Standard Time
Phone: 1-800-677-6337
Email: support@coursecompass.com

MyMathLab includes access to the AW Tutor Center.
That's right – toll-free phone tutoring!

Free Phone Tutoring
Sunday to Thursday 5pm – Midnight/12am EST.
Toll free 888-777-0463
You will need to know your CourseID to use this service. It is **adkins12090.**
(If you make use of the phone tutors, let me know if they did a good job. I'd appreciate your feedback!)

If you have local access to campus, IUP has "Homework Helper" math tutoring in Pratt Hall. These hours are not posted yet, but have typically been Mon-Thurs 6-9pm.

I will be posting my office hours on a weekly basis in the www.coursecompass.com site. Feel free to call me and email questions at other times too. I am here to help you! Ask when you have questions.

Syllabus Part III
MATH 125 Online
Dr. Adkins

This section covers the "Pencil and Paper End of Section Exercises" to be done in your journal.
Note: these exercises are practice *and learning* that you should be completing for every section.

Please mark the section number at the top of each page in your journal. Start each section on the top and front side of a new piece of paper (this is to help me in giving you credit for your work).

Number and complete each problem in a neat and clear manner. You need to show the details of your work on each problem for credit. Credit will not be given for just the answer as most of these are have solutions in the back of the textbook. You should also be checking your own answers with those in the back of the textbook.

Section	Assigned problems.
1.1	#1,3,13,15,19,29,45,53,61,63,71
1.2	#1,5,7,11,13,15,17,18,19,23,27
1.3	#3,5,7,9,18
1.4	#3,5,7,9,18
2.1	#1,3,11,29,33,41,45,49,51,67,73,75
2.2	#3,4,5,6,7,9,20,21,22,23,24,29,43,49,51
2.3	#1,2,3,7,9,11,13,15,21,25,27,37,39,43,46,47,48
2.4	#1,2,5,6,7,9,11,15,33,37,39,42
2.5	#1,5,7,11,13,19,23,25,29,31,37,47,51,59,69,77
2.6	#1,3,6,7,13,15,17,19,21,25,31, 37,39
2.7	#3,5,7,9,18
3.1	#1,2,3,4,9,11,13,21,31,33,43,45,47,49,53,57,75,76,81
3.2	#1,3,5,9,11,19,25,33,35
3.3	#1,9,23,25,29,37,41
3.4	#3,5,11,15,17,23,33,37,45,47
3.5	#1,3,7,15,17
3.6	#7,9,11,19,29,33,35,47
3.7	#1,7,9,13,17,23
3.8	#3,5,9,17,21,23
3.9	#1,5,15,17,23,30,37
3.10	#1,5,9,11,24,27
4.1	#1,7,11,13,19,26,27,29,31,37,41,50,51,53,61,67,71
4.2	#1,5,17,19,27,29,31,35,39,43
4.3	#1,3,7,21,23,27,29,35,45,51,52,55,59,65
4.4	#1,11,15,21,25,29,33,37,42,45,53
4.5	#1,7,15,31,37,49,53
4.6	#1,3,7,15,17
4.7	#3,5,7,9,18
4.8	#1,3,5,9,11,19,25,33,35
4.9	#1,7,15,31,37,49,53

5.1 #1,5,11,15,19,29,35,44,49
5.2 #1,5,9,15,21,25,29,30,31,35,39,45
5.3 #1,3,13,19,25,27,35,39,43,51,59
5.4 #3,7,11,29
5.5 #1,5,15,17,23,30,37

6.1 #7,9,11,19,29,33,35,47
6.2 #1,7,9,13,17,23
6.3 #3,5,9,17,21,23
6.8 #1,5,15,17,23,30,37
6.9 #1,5,9,11,24,27

7.1 #1,5,7,11,13,15,19,25,31,37,44,45,49,53,57,65,67
7.2 #1,2,3,5,7,9,13,17,29,31,37

(This is the "welcome letter" emailed to each student as they register for the class)

Welcome to MATH 125 online!

I am glad to have you in class!

As the class officially starts on August 25th, I thought that I would introduce myself, explain how the online class will work, and let you know what materials you will need to participate in the class.

About the Instructor:

I have been teaching in the Math Department at IUP since 1996. Prior to this, I taught for the Math Department at the University of Iowa while I completed my Ph.D. in Applied Mathematics and Computational Sciences and a Master's degree in Mechanical Engineering. My teaching responsibilities at IUP range from basic algebra to graduate courses. I regularly teach courses in calculus – like MATH 125 (which is an applied calculus course with an emphasis on applications appropriate for natural and social sciences). I have taught about thirty sections of calculus in my twelve years at IUP.

In addition to teaching math courses at IUP, I am also involved in computer applications. I occasionally teach courses related to computer science. Additionally, I am one of the founding co-directors of the IUP Software Development Center. From 1999-2004, I was also the technical specialist for the Keystone University Network and the Pennsylvania State System of Higher Education's Center for Distance Education. In this role I provided software development, support, and training for faculty and students in distance education classes statewide. In addition to my supporting role for statewide distance education, I have taught MATH115 five times as an online course. I look forward to working with each of you to make this a great learning experience.

How the online class will work:

You will need a computer with web-access to access the instructional content. You will also need the course textbook that comes bundled with a website access code. Later in this letter I will give the details of the required textbook.

The class is mostly asynchronous and web-based. Asynchronous essentially means without a synchronized time schedule, i.e. there is not a "class time". You will be able to do the homework, review of instructional content, and take the exams at any time of the day you choose. There will be progress deadlines that you will have to meet in order to keep you on pace with the material. Students will be allowed to work ahead with content and homework. This will be detailed in the course syllabus. You must also set-up/read your IUP email to get class information and updates.

Much of the online material you will be accessing for the course comes from Pearson's MyMathLab. MyMathLab is a website that provides the framework for you to interact with the mathematics content. Much of the content in MyMathLab requires installation of some browser plug-ins (free software that runs inside of the web browser). There is a plug-in installation web page that will guide you through the process. I also have a toll-free number that you can call for assistance (see below). You will need to have some administrative computer privileges in order to install the plug-ins. This is generally the default on most home computers and the installation web page is easy to use. However, if you intend to access the homework exercises through a computer lab, library, or other public resource, you may

need to plan ahead to have the computer lab administrator install the plug-ins on the computer you will be using. I am willing to work with public lab administrators whom you request to install the plug-ins.

I plan to have a session during the first week of class for those that are within short driving distance of IUP to come to campus for an orientation on use of the MyMathLab software, on installation of the plug-ins, help with setting up your IUP email account, and for any questions you might have. This session is not required. I realize that not everyone will need to attend this session and it is difficult to find a time that works for those who would like to attend. If you are interested in attending please send me an email: fadkins@iup.edu, so I can find a time that works for you!

During this session I will give a brief computer-based tour of the MyMathLab course supplement. As a preparation and introduction, please access the following link:
http://awhe.webex.com/awhe/playback.php?FileName=http%3A//www.aw-bc.com/orientation/webex/mymathlab.wrf
This is a WebEX Movie (plays through a self-installing applet ... just click on accept content from WebEX) that gives some details about what the software can do and how you will use MyMathLab. This takes about 4 minutes.

You may wish to have access to a graphing calculator, but this is not required and I will suggest some free software alternatives. Graphing calculators are nice because you do not need to be by a computer when doing pencil and paper homework exercises.

Registering for MyMathLab

You might want to register for MyMathLab and try out the "review" homework exercises prior to the beginning of class. You should have another email attachment that contains the instruction document for registering and logging into MyMathLab. Registration is easy and most of you will ***not*** need to review the instruction document. Start the registration by going to http://www.coursecompass.com, and clicking on "Register". Be sure to read the part of this letter below on the required textbook before doing the registration. You will need to know the "instructor's course ID": **adkins21333**. Please give your first and last name the same way IUP has you listed when registering. Also do not give a middle initial. Once you are registered, click on "DO HOMEWORK" and try the exercises for the Review Chapter.

The Student Tech. Support number can be helpful if you are having any problems in the registration or plug-in installation: 1-800-677-6337 OR support@coursecompass.com

As we begin this journey through calculus together, feel free to contact me with any questions or comments:
fadkins@iup.edu
(724) 357-3790 (work) (724) 357-7908 (fax)
(724) 349-7346 (home, please no calls after 9pm)
212 Stright Hall, Math Dept. IUP
Indiana, PA 15705

B3. Sample Lessons / Sample Exercises.

There is a four step process students use when covering material from each section of the textbook.

Step 1: Each day they should start in the "**Lessons/Tasks**" section for the chapter that you are working on.

Step 2: After completing the instructional material indicated in "Lessons/Tasks" for a section of the book, they read over that section in the textbook.

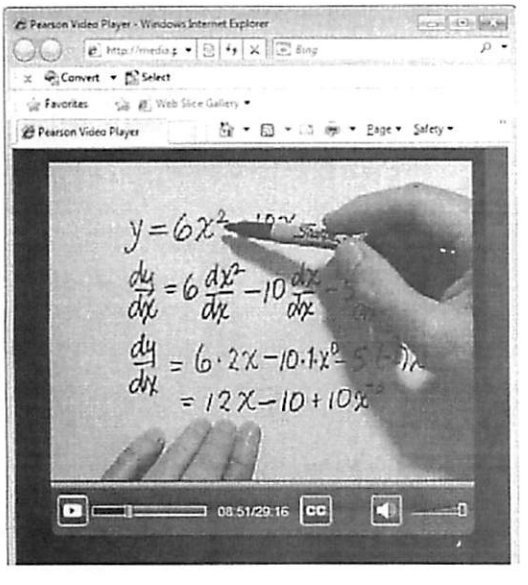
Step 3: Next you should go to "Online Homework" and complete the problems for that section.

The "Online Homework" problems generally have built-in feedback and additional opportunities to help you learn the content better. You should be using the "View An Example", "Help Me Solve This", "Video", "Animation", and "Textbook Pages" features displayed in each problem.

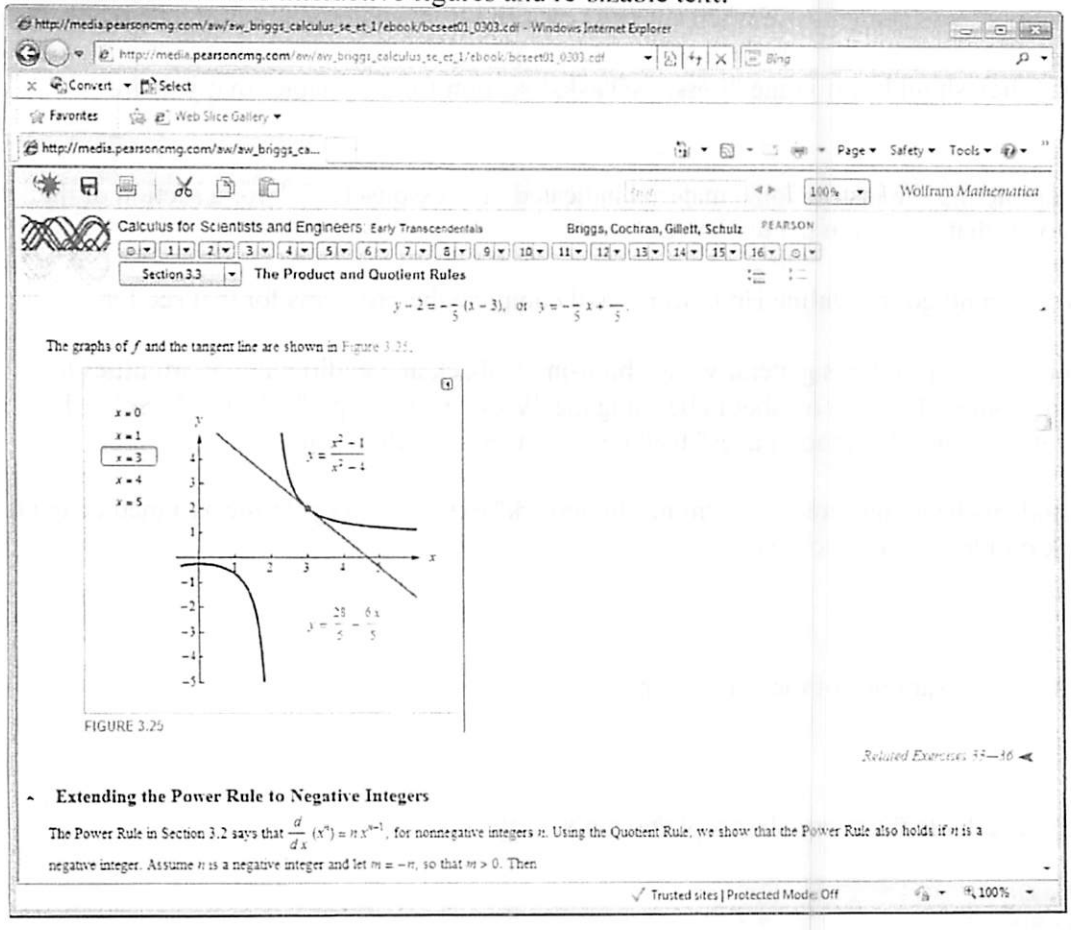
Step 4: Once students have mastered the "Online Homework" exercises, they do the assigned pencil & paper homework problem in their journal.

Here are some specific examples of the above steps:

Video lessons are available for every class topic/textbook section:



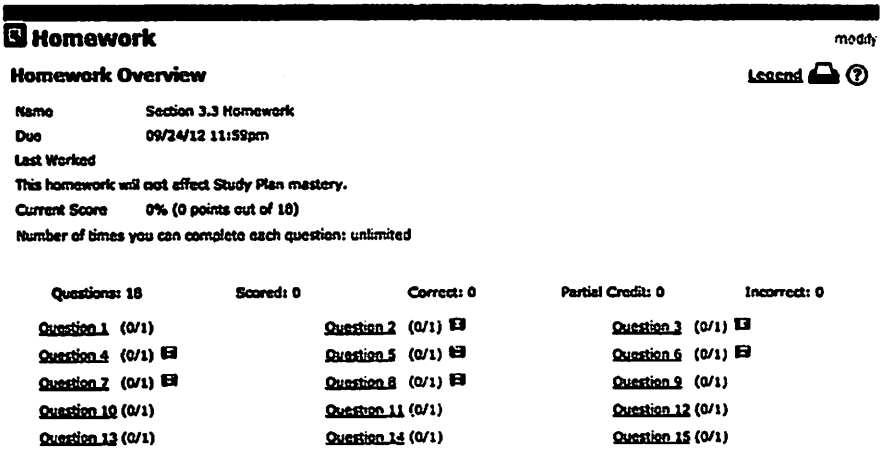
The online e-book has interactive figures and re-sizable text:



After reviewing instructional content (video and interactive text) on a section, the student will be prompted to start doing homework problems. The screen below shows the homework problem index.

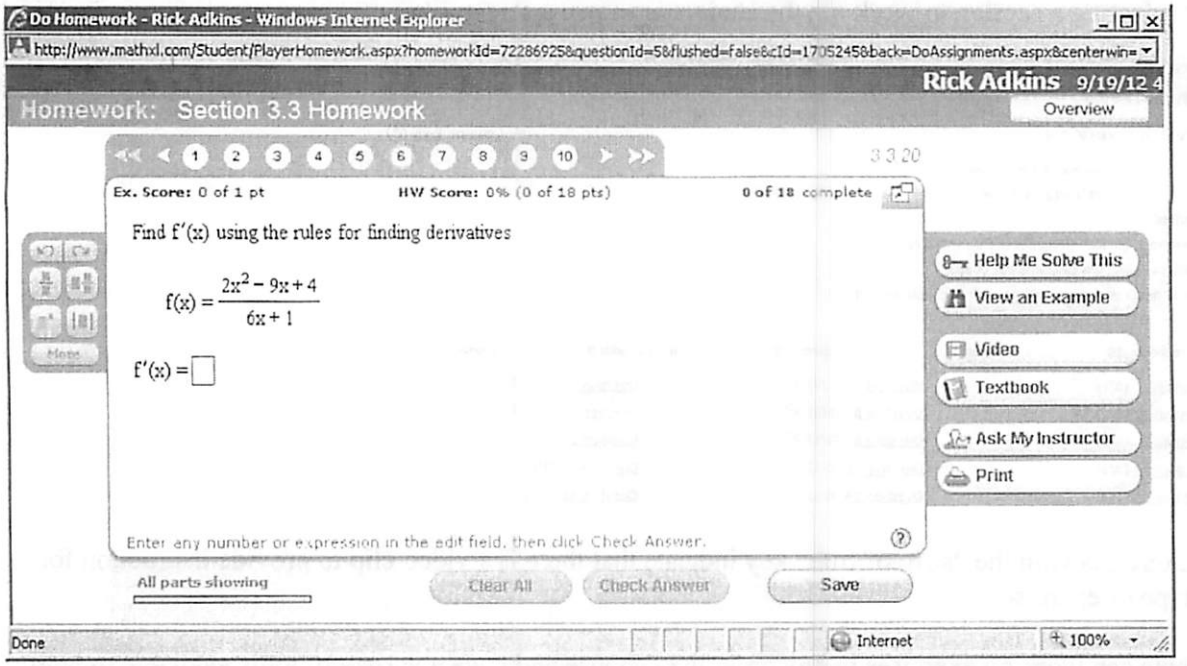
Due	Assignment	Time Limit	Attempts	Gradebook Score
09/03/12 11:59pm	Section 1.1 Homework			see score
09/03/12 11:59pm	Section 1.2 Homework			see score
09/03/12 11:59pm	Section 1.3 Homework			see score
09/03/12 11:59pm	Section 1.4 Homework			past due
09/10/12 11:59pm	Section 2.1 Homework			see score
09/10/12 11:59pm	Section 2.2 Homework			past due
09/10/12 11:59pm	Section 2.3 Homework			past due
09/10/12 11:59pm	Section 2.4 Homework			past due
09/17/12 11:59pm	Section 2.5 Homework			past due
09/17/12 11:59pm	Section 2.6 Homework			past due
09/17/12 11:59pm	Section 2.7 Homework			past due

After selecting a section to work on, the student is shown a screen like:



The exercises with the "strip of film" key indicate that there is a video clip to provide instruction for that type of exercise.

Students can work on exercises in any order they choose and have a variety of tools available to help them while the complete the exercises. As you can see from the sample problem below, there are links for "Help Me Solve This" which step the student through the current problem, "View an Example" which shows the student how to solve a similar problem, "Video" which is a video clip giving instruction on the theory behind a problem, "Textbook Pages" which hyper-link directly to the content related to this problem in the online textbook, and "Ask My Instructor" which sends the instructor and email with the students question.



Questions often have multiple parts to connect ideas from new content. For instance, a question could ask the student to determine whether the graph is symmetric to the y-axis. As a second part of that problem, the student is next asked to determine that this is equivalent to being an even function. Or a question could ask the student to find the rate of change of a population, and then find the marginal rate at some specific population level.

Many of the problems are interactive-open entry, asking the student to type in their solutions as noted in the figure above.