NSM DEPARTMENT REPORT TEMPLATE 2007-2008

Note: New additions for the 2007-2008 academic year include "Section I. Summary of Program Curriculum Changes" and "Section J. Program Assessment Activities and Results". This template also includes a copy of the Dean Scheck's "LAS Embedded Assessment Action Report", attached at the end. All copies of individual faculty/course "Embedded Assessment" reports for the year should be attached to the final department report for submission to the dean by the division chair.

A. With regard to process outcomes, provide a summation of unit highlights for the past year 2007-2008.

The Mathematics Department has gone through an intensive self-study process, complete with an external evaluation. As a result, we updated our curriculum and changed the credit structure of the majority of courses. The update will allow us to offer a program that aligns better with the national standards and with our local situation. In addition, we created an Applied Mathematics Track to better prepare students who wish to enter the private sector or graduate study in applied mathematics. The creation of the Applied Mathematics Track, with the associated new modeling course, gives more opportunities for the students to be exposed to applied mathematics, deterministic and stochastic models, and interdisciplinary applications.

Fourteen of the Mathematics Department students gave presentations at the Academic Excellence Showcase in 2008. There were also six posters by twelve students in the same event.

The Mathematics Department has observed a disparity between the curriculum in the College Algebra course (MTH 111) and the intended outcomes for this course. As a result, the department decided to change the objectives for this course. We have chosen a new textbook, which is highly modeling oriented. Over the last year, tenured and tenure track faculty have exclusively taught this class. For assessment purposes, a common final was created by the faculty teaching the course.

The Mathematics Department works closely with the Advising office, Registrar, DEP, and SEP to gauge the need for extra sections of remedial math courses.

B. With regard to intended student learning objectives, outcomes, please provide a narrative summary of significant student accomplishments (e.g. career placement, graduate school, scholarships, service learning, internships, study abroad) achieved by students in your unit (or students with whom your unit had significant interactions).

(NSM-Specific Student Placement Categories: Post-Baccalaureate Employment, Graduate

In number theory, Cheryl Beaver used a computer lab based guided-discovery type approach this year. The labs were designed to lead the students to discover the significant results in elementary number theory.

In college algebra (MTH 111), Laurie Burton, Hamid Behmard, Mike Ward, and Klay Kruczek started a completely new curriculum in utilizing modeling as the motivation point for students to learn college algebra related mathematics. The curriculum was also employed in precalculus (MTH 112) by Hamid Behmard and Mike Ward.

3. **Extensive participation in the development of well-articulated student learning outcomes and assessment of outcomes.**

Please, see section I.

D. Please identify faculty who accomplished any of the following in 2007-2008, including the titles of the works/projects etc.:

1. **Wrote a book and/or scholarly monograph that was successfully submitted for editorial and/or peer review and eventually published.**

Laurie Burton is the new co-author for the eighth edition of the Mathematics for Elementary Teachers: A *Conceptual Approach* textbook and the continuing co-author for the eighth edition of the Mathematics for Elementary Teachers: An *Activity Approach* textbook (started seventh edition) published by McGraw Hill.

2. **Completed one or more articles, book reviews and essays that were published in peer-reviewed journals or presses.**

Mike Ward with his coauthor Barbara S. Edwards wrote “The Role of Mathematical Definitions in Mathematics and Mathematics Education,” which appeared as a chapter in *Connecting Research in Undergraduate Mathematics Education to Practice*, M. Carlson and C. Rassmussen, Eds., Mathematical Association of America 2008.

Cheryl Bearer has submitted the article “Cryptology in the Classroom: Using Zero-Knowledge Proofs to Analyze Cryptographic Protocols”. It will appear in Cryptologia (accepted pending minor modifications).

3. Completed a textbook and/or a teaching manual for a textbook or original work that was peer review/juried and published.

She completed the second edition of "College Geometry Test Items File," published by Prentice Hall, December 2007.

4. Prepared peer-reviewed work or practice in the fine arts, including creative work in music, drama, artistic exhibits, productions and performances of artistic works or literature and subsequently performed.

5. Delivered a refereed paper at scholarly meetings or major professional symposia attended by specialists and leaders in the field.

Scott Beaver:

a. “Assessing Student Presentations of New Material in Advanced Calculus” - Mathematical Association of America (MAA) National Meeting, August 2007

b. “Probability and Statistics for Elementary Teachers at Western Oregon University” - MAA National Meeting, August 2007

c. “Seeing the Forest Through the Trees: How to Stop Students from Memorizing Proofs in Advanced Calculus” - MAA National Meeting, August 2007

d. “Invertible Integral Operators and Subexponential Kernel Decay” – Pacific Northwest Section Meeting of the MAA, June 2008

Cheryl Beaver:

a. “Zero-knowledge Proofs: How to convince someone you know everything without telling them anything.” given at the National Joint MAA, AMS Annual Mathematics Meeting, January 2008, San Diego.
b. “Common error patterns in pre-service teachers’ attempts at writing fraction word problems.” given at the Annual Meeting of the Pacific Northwest Section of the MAA, Helena, MT, June 2008
c. “Panel Discussion: What is happening in High School and Pre-Calculus and Below”, Co-session organizer with Klay Kruczek Annual Meeting of Pacific Northwest Project NExT, Helena, MT, June 2008

Hamid Behmard: SIAM (Society for Industrial and Applied Mathematics) conference on Imaging Science in July 2008 at San Diego. The title of the talk was "An Efficient Reconstruction Method for Band-Limited Images Using Nonperiodic Sampling Sets"

Laurie Burton:

a. "Visual College Algebra for Middle School Teachers", AMS/MAA Joint Winter Meetings, San Diego, CA, January, 2008
b. *Conference Sessions Organized*

"MAA Session on Curriculum Materials for Preservice Middle School Mathematics Teachers," Burton lead organizer, Fung and Kruczek co-organizers, sponsored by COMET, AMS/MAA Joint Winter Meetings, San Diego, CA, January, 2008 (17 papers were presented)

Maria Fung: "Exploring Concepts of Euclidean Geometry through Comparison with Spherical and Taxicab Geometries," co-presented with Dr. Tevian Dray, AMS-MAA Joint Mathematics Meeting, San Diego*, CA,* January 6, 2008

Klay Kruczek:

a. "*A Pairing Strategy for Tic-Tac-Toe on the Integer Lattice with Numerous Slopes*", Annual Meeting of the Pacific Northwest Section of MAA, Helena, MT, June 2008
b. "What is the most popular team?" Joint AMS/MAA National Meeting, San Diego, CA, January 2008
c. "Panel Discussion: What is happening in High School and Pre-Calculus and Below", Co-session organizer with Klay Kruczek Annual Meeting of Pacific Northwest Project NExT, Helena, MT, June 2008

Mike Ward: "What Is Studied In, Written For, and Remembered From Western Oregon University's Bridge Course," presented at the 2008 Joint Mathematics Meetings, San Diego*, CA,* January 6, 2008

6. **Secured an externally funded and peer-reviewed research grant.**

7. **Participated as a named investigator in sponsored, peer-reviewed research.**

8. **Securing competitive peer-reviewed external awards, grants/fellowships or other notable extramural support for scholarly endeavors.**

   The Mathematics Association of America invited Laurie Burton (August 2007) to submit a proposal to present a mathematics education workshop (following the successful Burton & Fung 2003 workshop). Given the competitive nature of PREP proposals (nationally only about eight are awarded annually), an invitation to submit a proposal is a fairly big deal. Laurie Burton, Cheryl Beaver, and Klay Kruczek submitted a grant proposal for Professional Enhancement Program (PREP) Workshop and subsequently received this grant. Their successful workshop was presented to 16 participants during the week of July 21 – 25, 2008 at the WOU campus.

E. Please identify faculty (and/or approximate percentage of unit faculty) who made significant or extraordinary accomplishments in the following areas in 2007-2008. * Given the relative lack of data in these areas, please provide best estimates and or representative samples.

1. **Special contributions to the faculty governance of the institution, particularly including service activities as a very valuable departmental colleague and/or faculty mentor.**

   Klay Kruczek has been the main force behind the major overhaul of the Mathematics Department program. He was in charge of entire process of switching upper level mathematics courses from 3-credit courses to 4-credits. This included revising schedule (rotation of courses), degree requirements, degree plans, implementing new degree option (Applied Mathematics), and new courses (Mathematical Modeling and Capstone Experience for Mathematics Education Majors). He has also been the primary scheduler of the Mathematics Department for 2007-08 and 2008-09 academic years.

   Scott Beaver was WOU Faculty Senate Secretary and he is elected to be a member of the Faculty Senate Executive Committee At-Large for AY 2008-09. He was also WOUFT Local 2278 Secretary and he is elected to be the Treasurer for AY 2008-09. He drafted the letter from Faculty Senate President Shaun Huston and WOUFT President Peter Callero to Governor Kulongoski requesting disbursement of the frozen salary pool funds.

The move of the Mathematics Department to the Mathematics and Nursing Building will occur in the Fall of 2009. Laurie Burton was the liaison of the department with architects, UCS, and physical plant planning committee. She has done an incredible job of making sure every detail is taken care of as planned.

Mike Ward is the Chapter advisor for Pi Mu Epsilon, the national math honorary, and student chapter of the Mathematical Association of America.

2. **Extensive service to students outside of the formal classroom, beyond regular advising.**

Cheryl Beaver, Maria Fung and Klay Kruczek have been the primary advisors for three of the graduating seniors' papers. Scott Beaver, Cheryl Beaver, and Klay Kruczek have also been extensively advising three other graduating seniors on their papers.

Maria Fung has also supervised one student summer research which resulted in the student's presentation at the Nebraska Conference for Undergraduate Women in Mathematics February 2008.

Mike Ward has sponsored two student talks and five student posters and the Academic Excellence Showcase, which means he taught the courses and supervised the projects reported in the talks and posters.

Cheryl Beaver with the support of Scott Beaver, Maria Fung, Klay Kruczek, and Mike Ward organized the Fourth Annual Sonia Kovalevsky Day in April of 2008. The above mentioned faculty and several of the Mathematics Department students participated in the activities for that day.

Mike Ward accepted to have an independent study with a student to help her to graduate in time to enter the MAT program in January 2008.

3. **Extensive participation in University fund raising, public relations or alumni development.**

The Mathematics Department is (with very little success) exerting every effort to include important and worthy news about the department in public relations venues. We believe the followings news should be publicized.

a. Acceptance of four of our students in national PRE-REU and REU programs (REU: Research Experience for Undergraduates)

b. Sonia Kovalesky Day, outreach for high school girls

c. Award winning presentation at a national meeting for best undergraduate research

d. MAA PREP Workshop organized by Cheryl Beaver, Laurie Burton and Klay Kruczek entitled *"Active Learning Approaches and Visual Methods for Teaching the Foundational Mathematics for Elementary Teachers Courses."* The workshop is funded by the Mathematical Association of America.

4. **Extensive participation in student recruitment/admissions and student retention activities and other special assignments related to the business of the University.**

Tenured and tenure track faculty in the Mathematics Department have been actively participating in the following events.

a. Early Bird registration
b. Preview Day
c. SOAR
d. Professor Chat
e. How to Succeed in Mathematics and Science during New Student Week

5. **Developed new or innovative programs and active participation in the curriculum development, program review and assessment process.**

Under the direction of Mike Ward and Klay Kruczek, the Mathematics Department has conducted a self-study in 2007. As a result, the department began to give exit interviews to graduating math majors during the 2006-07 academic year. We began to administer the Major Field Test in Mathematics, put out by ETS (see below for results of this year's test), to graduating mathematics majors in the 2007-08 Academic Year. We conducted an alumni survey of graduates from the past five years. We will administer the alumni survey every five years and continue to annually interview and test the graduating majors. All of this will provide data from which we may see how the program changes have affected mathematics majors.

6. **Demonstrated leadership in local, state, federal or international agencies, professional and public interest organizations and other entities that substantially enhance institutional goals.**

Klay Kruczek is the President-Elect of OMEC: The mission of the Oregon Mathematics Education Council (OMEC) is to propose, through intersegmental study and deliberation, recommendations to improve the learning environment in mathematics in Oregon schools at all levels, early childhood through college, and to sponsor activities and proposals to improve the pre-service and in-service training of teachers, classroom instruction, and articulation of the curriculum at all levels. Representatives from four-year and two-year institutions (public and private), industry, public and private schools (K-12), and the Oregon Department of Education participate in OMEC.

MAA PREP Workshop organized by Cheryl Beaver, Laurie Burton and Klay Kruczek. The workshop is funded by the Mathematical Association of America.

Laurie Burton is a member of the "Committee on the Mathematical Education of Teachers" of the Mathematical Association of America. She has also been a member of the faculty panel evaluating Curriculum Materials for Group Theory courses at Portland State University.

F. Personnel - please provide a summary of professional development activities provided for or undertaken by staff in your unit, including unit managers.

Scott Beaver:

1. Finished work on the Banach Algebra paper and submitted it for publication at the end of June.

2. With Cheryl Beaver have finished data collection on the IRB-approved peer-assessment study and will finish writing and submit the paper this summer.
3. Is in the process of developing 253 into a logic vehicle, without sacrificing content, is apparently new and I've begun work on a pedagogical paper to be submitted this summer.
4. Begun work on a Löwdin Orthogonalization paper to be submitted either this summer or early fall.

Cheryl Beaver:

1. Continue to work on an IRB-approved study with colleague Cheryl McAllister of Southeastern Missouri State University regarding Fraction Staudy.
2. With Scott Beaver have finished data collection on the IRB-approved peer-assessment study and will finish writing and submit the paper this summer.
3. Along with Laurie Burton, Klay Kruczek, Maria Fung and I submitted a prospectus to edit a book for the Mathematical Association of America (MAA). We were encouraged to go ahead with the project. The book will be a collection of articles on Middle School education programs. We are in the process of collecting abstracts for the volume and Klay and I plan to submit an article on WOU's program as well.

Hamid Behmard:

1. Submitted a paper to the IEEE Transactions on Signal Processing for review. The title of the paper is "Efficient Reconstruction Algorithms Using Shifted Lattices".
2. Refereed one paper for *the IEEE Transactions on Signal Processing* and in the process of refereeing a second paper for the same journal.

Laurie Burton:

1. Visual Algebra for College Students, student book and instructor materials.
   Wrote materials during 2006 - 07 sabbatical. Class tested materials fall 2007, then updated, Kruczek class tested materials spring 2008, she will update

materials and use again, fall 2008 (all in Math 392: College Algebra for Elementary Teachers). She is currently working with the non-profit Math Learning Center (Salem, Oregon) to publish these materials in their catalog.

2. **MAA Notes Volume**
   Based on work offering and leading sessions on the mathematical education of middle school mathematics teachers, the Mathematics Association of America invited her along with C. Beaver, Fung and Kruczek to submit a proposal to compile and edit a collection of articles and resources, "*Programs, Courses and Resources for Training Preservice Middle School Mathematics Teachers"* as a volume in the MAA Notes Series. Their proposal has been accepted and they have just begun their work (inviting and collecting abstracts) as editors of this MAA Notes book.

Klay Kruczek:

1. *Math and Maps*, K. Kruczek*, the Oregon Mathematics Teacher (TOMT), January/February 2008.
2. He and a colleague studied Tic-Tac-Toe played on $\mathbf{Z}^d$ with n rational slopes, instead of the typical horizontal, vertical, and diagonal slopes. They submitted a paper on this work, which has been partially accepted. The same colleague and he showed that in a similar game, Player 1 can win given certain bounds on n and d. They are just finishing up the result on this paper. The editors of the journal would like both of the previous results combined into one paper.
3. He is in the process of finishing the course pack for prospective K – 8 teachers in the field of discrete mathematics. He plans to publish the course book via the Math Learning Center.

Mike Ward:

1. Joint research with Jen Carmichael '06 and Keith Schloeman '07 on Cayley-Sudoku Tables. Manuscript submitted for publication.

2. Research with L. C. Kappe, G. Mendoza, and M. Mazur, Binghamton University, "On some minimality conditions involving elements of prime

order in a group." Manuscript for publication in preparation.

3. Refereed one paper for *Communications in Algebra* and two (one brief and one full) for *Journal of Pure and Applied Algebra*.

4. Reviewed Michael Bacon's scholarship file for promotion and tenure at University of South Carolina, Sumter.

G. Personnel Status

Identify Special Staffing Situation:	Explain Proposed Plan of Action:
Due to increase of students at WOU and their need to take required math courses and the move of the Mathematics Department to a new location (MNB) to just name a few, the office specialist's duties have increased dramatically. The department recognized the need to have a staff with OS2 rank instead of OS1.	The department made the proposal to make the change. It was approved by the Dean and the Human Resources.

H. Strengths, Weaknesses, Opportunities and Threats: Looking ahead & Prioritizing for 2008-2009

With reference to strategic planning documents, identify specific that you believe constitute the greatest strengths, weaknesses, opportunities and threats for your unit going forward. Discuss your plans to address these matters.

I. Summary of Program Curriculum Changes for 2007-2008

Please provide a summary of program curriculum changes that were initiated this past year. In your summary, provide a brief short title/description of the change, the status of

the change (options: proposed, final approval pending, approved, in new catalog), and a list of program outcomes to which the change is linked.

The Mathematics Department has conducted a self-study in 2007, which was reviewed by external reviewers. As a result, the department proposed an extensive program overhaul. The change includes but not limited to switching upper level mathematics courses from 3-credit courses to 4-credits, revising schedule (rotation of courses), degree requirements, degree plans, implementing new degree option (Applied Mathematics), and new courses (Mathematical Modeling and Capstone Experience for Mathematics Education Majors).

This program overhaul was approved by the Curriculum Committee and the Faculty Senate. The changes are implemented in WOU 2008-2009 course catalog.

Expected Outcomes from Mathematics Program Changes

The proposed changes are not designed with new outcomes in mind. Rather, the changes are in support of the outcomes developed in anticipation of the accreditation process for WOU, which are

1. Problem Solving Skills – the ability to analyze complicated problems in a variety of subject areas, and to synthesize solutions to such problems.
2. Modeling Skills – the ability to translate various real-world scenarios into mathematical models.
3. Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.
4. Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Including working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.
5. Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.
6. Subject Awareness – an awareness of the distinction between applied and theoretical mathematics, an appreciation of the connection between the two fields, and a reasonable perception of the breadth of each field.

7. Career Awareness – an awareness of the career and educational opportunities for mathematics majors; this many include internship and undergraduate research experiences.

The body of the proposal submitted to the Curriculum Committee indicates why we think the proposed outcomes will help us achieve these outcomes. See item 5 on pages 2-3 of the proposal. Moreover, the new applied mathematics track (item 6, page 4) is specifically directed at outcome number 6.

Assessment

Our proposal sketched a plan for tracking success (item 7, page 4). It was a summary of some of the relevant parts of the assessment plan contained in our 2007 departmental self-study. They were detailed in a table contained in a memo to Dean Scheck on January 30, 2008. We will have at least two years of data before the proposed changes take place. We will compare with data after the change both to see if the outcomes are being met and if they are being met more fully as a result of the changes.

J. Program Assessment Activities and Results

Provide a summary of program assessment activities and results from the past year, include evidence that the assessment activities are leading to the improvement of teaching and learning. Departments are to keep written records of review/assessment discussions and actions. Please submit descriptions of such engagement in the annual departmental report to the division.

1. Embedded Assessment Results. Provide results of Spring 2008 embedded assessment activities mapped to one or more of the program's learning outcomes. Each faculty member is expected to participate in embedded assessment and to file an embedded assessment action report, submitted to division chair and forwarded to dean's office. As necessary, fill out the attached form (see below, at end of report template) for each participating faculty member and course(s).

Our department has an assessment plan in place. Each faculty carries out parts of the plan relevant to his/her department teaching and assignments (archiving samples of student writing and exams, conducting exit interviews, etc.) Please, find individual embedded assessment logs at the end of this report.

2. Other embedded approaches. Provide documentation of other assessment methodologies including capstone reports, oral presentations, senior theses, writing portfolios, service learning accounts, laboratory reports, creative arts portfolios, etc., mapped against a program learning outcome. Provide departmental evidence that these student works are being assessed, collectively, and tabulated for departmental program review and decision making. Representative samples and an assessment rubric should be collected and numerical data should be compiled on how many students performed above/at/below desired proficiency.

For the purposes of this report, provide a summary list of these activities, an overview of results, and faculty members who are responsible for archiving the documentation.

Hamid Behmard has supervised the Senior Project (MTH 403) last year. This course includes writing a capstone paper, which in most cases would be an expository paper based on a published mathematics paper. The students in this course also present their papers in a two one hour lectures to their fellow classmates and the rest of the department. Many of our sophomores and juniors and faculty attend these presentations. These presentations are video taped and archived as part of the Mathematics Department assessment plan. They also present a summary of their paper at the Academic Excellence Showcase. Our graduating seniors also complete an exit interview and a Major Field Test in mathematics (see below for results of the test for last year). Copies of the rubric for senior paper and presentations and also the exit interview are provided at the end of this report. Each year, the faculty who is in charge of Senior Project (MTH 403) is also responsible for archiving the documentation.

3. Exit and Proficiency Exams. Provide a summary of results from any program-related exit or proficiency exams (e.g. ETS specialty exams, state licensing exams, etc.). Describe how these results are being used to map program outcomes and guide improvements in teaching and learning. Include a list of faculty members who are responsible for archiving the documentation.

Exit interviews are conducted for academic year 2007-08 and archived. They are accessible through the M-drive under the folder Exit Interviews. Theses interviews will be reviewed by the faculty and if needed specific actions will be taken accordingly.

A summary of the ETS test is given below. As you see, from ten students who took the test, two are in the top 5%, one in the top 15%, and the rest are in the top 50% and below. However, we don't believe the result of this test is a true measure of our students' mathematical skills. As stated in the syllabus for MTH 403, the results of these tests were not affecting the students' grades in that course. Hence, the students did not have any motivations to prepare themselves for the test. Also, the time of the test, finals week, and its proximity to graduation may have affected the students' concentration and preparation for the test. Therefore, the department will take these observations under consideration and make appropriate changes for future. For the academic year 2007-08, Hamid Behmard was responsible for archiving the documentation. Each year, the faculty who is in charge of Senior Project (MTH 403) is also responsible for archiving the documentation.

DEPARTMENTAL ROSTER

Institution: Western Oregon University

Test : MATHEMATICS

Form Code: 4AMF

Cohort : MFT PPT MATHEMATICS 50059

Processing date: June 12, 2008

Student Name	Student ID	TOTAL SCORE	N/A	N/A	N/A	N/A
BARGER, MEGHANN R	00177816	166				
BEMETZ, MING	0001890 6	152				
BRUGGEMAN, JASON	00181155	134				
BURKE, ELIZABETH M	00188454	181				
CHARLTON, AMANDA B	00198316	152				
CORRELL, KIMBERLY M	00193751	155				
HUEBNER, ROSCO B	00209037	146				
PALKE, DARREL K	00182788	184				
PICKETT, ANDREW L	543477168	143				
STOWELL, COURTNEY A	00187449	149				

Number of candidates tested : 10

Total score and subscores are reported as scale scores. The scale range for the total score is 120-200. The standard error of measurement, an index of the variation in all test scores due to imperfect precision of the measurement process, should be considered when interpreting individual test results. See the "MFT Comparative Data Guide" on the web at www.ets.org/hea/mft/compare.html for an explanation and listing of the standard errors of measurement.

* An asterisk preceding the name indicates that this student answered (marked) fewer than half of the questions. The scores of this student are not included in the group means.

Major Field Tests

Listening. Learning. Leading.

Major Field Test in Mathematics (form: 4AMF)
Institutional Means Total Score Distribution
Data includes Seniors from Domestic Institutions -- February 2004 to June 2007

Mean Total Score Range (120 - 200)	% at or below
171 - 200	95
170	90
169	
168	
167	
166	85
165	
164	80
163	
162	75
161	
160	70
159	65
158	
157	60
156	55
155	50
154	45
153	40
152	35
151	30
150	25
149	20
148	
147	15
146	
145	10
144	
143	
142	5
141	
140	
120 - 139	1

Number of Institutions	238
Mean	154.3
Median	154
Standard Deviation	9.1

Total Scores are reported as *scaled scores* .
% at or below based on percent below the lower limit
of the score interval.

LAS
Embedded Assessment Action Report
For
Program Review

learning outcome **general education goal**

<u>Math 440 Project and Presentation</u>

This was an advanced topics course in algebra with a focus on the field of Cryptology. This project was designed to have the students investigate how

the mathematics of Cryptology has been applied to important and practical applications in the real world.

Math 440 Project Step 1: Choose a Topic

Directions: Identify your top 3 choices for your project topic. You may choose from the list below or propose your own topic. You will be required to write a paper and give a 20 minute presentation on your topic. If you wish you may choose a partner. Both people must agree to work with each other. If you have a partner, your presentation must be 40 minutes long and your paper will have additional requirements as well (to be outlined in later instructions).

Due: Topic choices are due on Monday. I will assign topics after I review your choices.

1. Micropayments (Peppercoin -Rivest)
2. Cryptography in WWII
3. Secret Sharing
    a. Group signatures
    b. Distributed Data Storage
4. Cryptography on the Internet/ Transport Layer Security (TLS)
5. Secure Voting (Rivest)
6. Key-escrow / Clipper Chip and Capstone Chip
7. Advanced Encryption Standard (AES)
8. Data Encryption Standard (DES)
9. Audit control / e.g. Tripwire
10. Public Key Infrastructure (PKI)
11. Pretty Good Privacy (PGP)
12. Copyright control/content control –
    a. Digital Millennium Copyright Act (DMCA)
    b. Pay-Per-View/other
13. Hash Collisions (and digital signatures)
14. Zero-knowledge proofs
15. Radar tags (RFID)
16. Bluetooth
17. Stream ciphers – LFSR & polynomials
18. Biometrics

Milestone	Description	Due Date	Points
Outline	Brief Outline of main topics	5/5	10

Pre-Presentation	Email Cheryl slides for presentation and have a meeting with Cheryl about presentation	At least 2 days before your presentation	20
Presentation	Electronic (Power Point or Beamer) presentation (alternate presentation method by request). Length for single presenter: 20 minutes with 5 minutes for questions. Length for two presenters: 40 minutes with 5 minutes for questions. See Student Presentation Scoring Guide and Rubric for scoring information.	Various	100
Paper	Paper must be at least 5 pages long (for single author) or 10 pages (for 2 authors) NOT including references, pictures, or algorithm descriptions. Paper will be graded based on 1. Content 2. Clarity and Organization 3. Mechanics (grammar, spelling, punctuation, proper citations, length, etc.) ** Draft due on Friday May 30th	Monday June 9, 2008	140
Attendance	You are required to attend all presentations. There will be presentations during your scheduled final exam time of 12-2 on Monday June 9th. You will loose 2 points for each *person* whose presentation you miss.	Various	30
Total			300

LAS
Embedded Assessment Action Report
For
Program Review

learning outcome **general education goal**

Problem Writing

interesting **relevant**

Prescribed Strategy

Problem

- **Solution**
- **Verification**
- **Comments for Teachers**

Comments for Teachers

LAS
Embedded Assessment Action Report
For
Program Review

learning outcome **general education goal**

Exam Questions

e e eg W l On o e tn re a h e r dc e o Yn pdg t l l o te g t l aio gfa o n u sf l g a ar a a rs s a ta or ar n ti t

e e eg n W i On e oh s s. tn r r A m a N μ_X X ,t (. 0 0 2~2 5) a N d μ_Y h e , .(0 0 .) 4 4T

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$$H_0 \ \mu_X = \mu_Y$$

g h e l es a an e h i h e n ty tp ots rs i t v t i

$$H \ \mu_X > \mu_Y$$

g c u s e c en l e o cal ri n f d i o . 0 0. f5

a) n l ea osn pm d am o= g nu f 30 s sh e b a sor a y u i t $\overline{x} =$ n ft .d 0, 4 a n da o a i m d r

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c e c e o e nl n f d nh pc p a lo t r v o th se h rot t ho en y pe i fo s s st l ? t nxi p a) E i t .a n i

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p . . m. f

$$f(x) = \frac{\lambda^x e^{-\lambda}}{x!} \quad x = , 0, , .2 . 1$$

h e F n l x e l dh a ne t m k o o s i i dm ao λ t . f t r r

Statistics Project

LAS Embedded Assessment Action Report For *Program Review*

BA, BS,

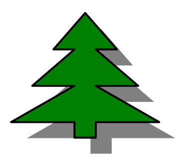
learning outcome **general education goal**

See the next page

Math 213; essay type homework question

Math 213; class presentation assessment task
Scavenger Hunt

Math 213; exam question



LAS
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For

Program Review

e g e e g D P o s _am_ _h r (: r c SM B a s_m_ _a_ _ _t_ _ _i_ t____________________

, (B SA FB , MB A, eM c S L C , CA .) t

e u lse C h _T_ / r :M i _t_ _2_ _5_3_ _ _t____________________

c l euF y a c n_ _am_e ct: S _ _ _B_ _ _t_t_ _ _ _v_ r____________________

e D a : t 3 06 / /8

e h e g) S A pa o t t **learning outcome** o **general education goal** se s s s s a sm n i t

l e n k o i d : t

Mathematical Knowledge
Problem Solving Skills

Note: Mathematics Department Self-Study Assessment tools included entire final exams. It seems most reasonable to use the exam in its entirety as the assessment tool, since all individual questions and the exam taken as a whole are constructed to measure the above learning outcomes.

h e c h e e) eC e k e m e s st bs s ld da d e m a so u s) (t t :d

Exam questions

- ☐ s s y E a
- l e c ☐ O p s a n o r a n r ti t
- h e ☐ s s T i
- l ☐ P o os o f r t i
- c c ☐ P e u c ea e m S r g i t/ L a ir v n ir
- e ☐ p se C ca p p u j p a t o / r r t
- h e ☐ O ____________t_ _r____________________

Western Oregon University

FINAL EXAM

Math 253 - Calculus III - Spring Term 2008
June 11, 2008
Instructor: S. Beaver

NAME:

Closed book, closed notes, no calculators permitted. Please show all your work and justify logically each step by citing an appropriate theorem (if necessary), and explaining why its hypotheses are satisfied, as in the homeworks.

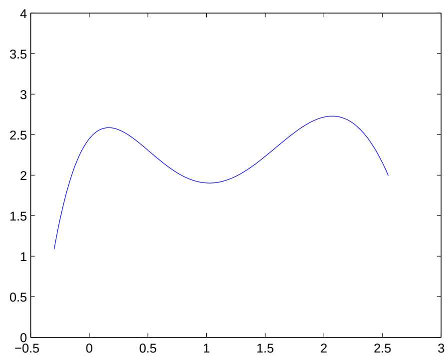
Problem	Points
# 1	
# 2	
# 3	
# 4	
# 5	
# 6	
# 7	
# 8	
# 9	
# 10	
Extra Credit	
TOTAL	

1. (20 points) Find a power series representation for $f(x) = \dfrac{x^2}{(1+x^5)^{\frac{4}{7}}}$.

2. (20 points) Prove that $\dfrac{n^n}{(2n)!} \longrightarrow 0$.

3. (14 points) Find the sum of the series $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$.

4. (12 points; 6 each) Explain your answer in each case.



a). Could the function in the above graph be represented by the power series $1-(x-2)^2-3(x-2)^3+\cdots$?

b). Could the function in the above graph be represented by the power series $2+3x+5x^2+\cdots$?

5. (18 points) Find a PSR for $\displaystyle\int \frac{x^4}{(3x+2)^2}\,dx$ and give the radius of convergence.

6. (20 points) Find a PSR for each.

a). (8 points) $\int x^4 \cos x^7 \, dx$

b). (12 points) $x^3 \ln(1 + x^5)$

7. (18 points) Determine whether or not $\sum_{n=2}^{\infty} \frac{\sin^2 n}{n^3 - 7}$ converges.

8. (10 points) For which values of x does $\displaystyle\sum_{n=2}^{\infty} (\ln x)^{2n}$ converge?

9. (11 points) Determine whether or not $\sum_{n=1}^{\infty}(-1)^n \cos\left(\frac{1}{n}\right)$ converges.

10. (7 points) Find the sum of $\sum_{n=0}^{\infty}(-1)^n \frac{\pi^{2n}}{4^n(2n)!}$. *Hint - a known series...*

Extra Credit (10 points, 2 each for the correct explanation only) True or False: Circle T if the statement is *always* true; circle F if it is not, and justify your answer with a counterexample in the case of an F, and a short explanation in the case of a T:

a). T F $\sum a_n$ converges $\Rightarrow$ $\sum \frac{1+a_n}{2+a_n}$ converges.

b). T F The AST cannot be used to show a series diverges.

c). T F If the sequence of partial sums of a series with positive terms is bounded then the series converges.

d). T F If $\sum a_n 7^n$ converges, then $\sum a_n(-8)^n$ diverges.

e). T F If $f(x) = 3 - x + 4x^2 - 5x^3 + \cdots$ converges for all x, then $f^{(3)}(0) = -30$.

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e g e e g D P o s _am_ _h)e r (: r c SM B a s_m_ _a_ _ _t_ _ _i_t_

, (B SA FB , MB A, eM c S L C , CA .) t

e u lse C h _T_ _/ r :M i _t_ _2_ _5_ _ _ _4t_

c l euF y a c n_ _am_e et: S _ _ _aB_ _ _t_t_ _ _ _v_ _r_

e D a : t 3 0 6 / / 8

e h e g) S A pa o t t **learning outcome** o **general education goal** se s s s s a istm n i t
l e n k o i d : t

Mathematical Knowledge
Problem Solving Skills

Note: Mathematics Department Self-Study Assessment tools included entire final exams. It seems most reasonable to use the exam in its entirety as the assessment tool, since all individual questions and the exam taken as a whole are constructed to measure the above learning outcomes.

h e c h e e) eC e k e m e s st bs sld da d e m ao so u s) (t t :d

Exam questions

- ☐ s s y E a
- l e c ☐ O p s a n o r a n r ti t
- h e ☐ s s T i
- l ☐ P o os o f r t i
- c c ☐ P e u c ea e m S r g i t/ L a irr v n ir
- e ☐ p se C oa p p u j p a t o / r r t
- h e ☐ O _ _ _ _ _ _ _ _ _ _ _t_ _r_

FINAL EXAM

Math 254 – Multivariate Calculus
June 9, 2008
Instructor: S. Beaver

NAME:

Please do all of the problems. Closed book, closed notes. Please show all your work.

PROBLEM	GRADE
# 1	
# 2	
# 3	
# 4	
# 5	
# 6	
# 7	
# 8	
TOTAL	

1. (15 points) Find the volume of the solid that the cylinder $r = 4\cos\theta$ cuts out of the sphere of radius 4 centered at the origin.

2. (9 points) Find a parametric representation for the part of the hyperboloid $x^2 + y^2 - z^2 = 1$ which lies to the right of the xz-plane.

3. (15 points; 5 each) Change the order of integration for the triple integral

$$\int_0^1 \int_{2\sqrt{x}}^2 \int_0^{2-2y} f(x, y, z)\, dz\, dy\, dx$$

as directed:

a). integrate first wrt x, then wrt y, then wrt z.

b). integrate first wrt y, then wrt z, then wrt x.

c). integrate first wrt y, then wrt x, then wrt z.

4. (15 points) Set up *but do not evaluate* triple integrals for finding the mass of the region outside the cylinder $x^2 + y^2 = 1$ and inside the sphere $\rho = \sqrt{3}$ with density $\rho = zx^2$ in

a). spherical coordinates (8 points)

b). cylindrical coordinates (7 points)

5. (14 points) Find the volume of the region bounded by $x = 0$, $y = x^2$, $y = 4$, $z = 0$, and $z = 16 - x^2 - y^2$.

6. (9 points) Find the curvature $\kappa(t)$ for $\mathbf{r}(t) = t^2\,\mathbf{i} + t\,\mathbf{k}$.

7. (10 points) Find all points at which the direction of most rapid change of the function $f(x, y) = x^2 + y^2 - 2x + 4y$ is $\mathbf{i} - \mathbf{j}$.

8. (13 points) Find the area of the part of the surface of the function $z = xy$ which lies inside the cylinder $x^2 + y^2 = 9$.

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learning outcome **general education goal**

Mathematical Knowledge (Questions 1, 2, 4, 5, 6)
Problem Solving Skills (All Questions)
Skilled use of Methods of Proof (Questions 1, 2, 4, 5, 6)

Note: Mathematics Department Self-Study Assessment tools included entire final exams. It seems most reasonable to use the exam in its entirety as the assessment tool, since all individual questions and the exam taken as a whole are constructed to measure the above learning outcomes.

Exam questions

- [ ]
- [ ]
- [ ]
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- [ ]
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l e e P s scu a h mp yodb a o sie t f ohap n ito eoi t r L c erSt ts A t ’ mo d . f f i

FINAL EXAM

Math 416 - Complex Analysis
Instructor: S. Beaver
June 9, 2008

NAME:

Please show all your work.

PROBLEM	GRADE
# 1	
# 2	
# 3	
# 4	
# 5	
# 6	
TOTAL	

1. (15 points) Show by definition that the set $T := \{z \in \mathbb{C} : |z| \leq 2\}$ is closed.

2. (15 points) Prove Liouville's Theorem: Every bounded entire function is constant.

3. (20 points) Compute $\displaystyle\int_0^{2\pi} \frac{d\theta}{\cos\theta - 2}$.

4. (15 points) Prove that the set $\left\{ \dfrac{e^{\frac{in\pi x}{L}}}{\sqrt{2L}} \right\}_{n \in \mathbb{Z}}$ is orthonormal on $[-L, L]$.

5. (15 points) Prove that if for some $r > 0$, if f is continuous on the disc $|z| < r$, then

$$f(z) = \lim_{n\to\infty} \frac{1}{2\pi i} \int_{\gamma_n} \frac{f(w)}{w - z}\, dw$$

where $\gamma_n := \left\{ z \in \mathbb{C} \;\middle|\; |z| = \frac{1}{n} \right\}$.

6. (20 points) State and Prove Cauchy's Formula.

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(13 pts.) 2. Determine whether the given differential equation is exact. If it is exact, find the solution.

$$(2xy^2 + 3x^2)dx + (2x^2y + 4y^3)dy = 0$$

(13 pts.) 6. Find the solution of the given IVP.

$$y'' + 4y = t^2 + 3e^t, \qquad y(0) = 0, \quad y'(0) = 2$$

(15 pts.) 7. A mass weighing 8 lb stretches a spring 1 in. The mass is attached to a viscous damper with a damping constant of 1.5 lb-sec/ft. If the mass is set in motion from its equilibrium position with an upward velocity of 4 in./sec, find its position ıu at any time t. Plot u versus t. Determine when the mass first returns to its equilibrium position. Also find the time τ such that $|u(t)| < 0.01$ in. for all $t > \tau$.

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learning outcome **general education goal**

RUBRIC FOR SENIOR PROJECT PAPER SPRING 2008

	Criteria (from syllabus)	Not met 1	Largely met 2	Fully met 3	Exceed 4	Wt.	Total
Mathematics	Appropriate depth & sophistication; significant mathematical content; shows the sophistication expected of an upper division math student					2	
	Correctness: definitions, theorems, proofs correct				N/A	2	
	Clarity: definitions, theorems, proofs clear					2	
Originality	Original collection of related materials, includes original examples or special cases (when possible), not overly bound to the style of the source.					2	
Drafts	Incorporated draft feedback				N/A	2	
Mechanics							
Formatting	AMM style; typed; 1.5 spacing				N/A	1	
Bibliography	Sources in AMM style; citations in one of the two styles on the Guidelines.				N/A	1	
Grammar & Writing	Good sentence structure; easily understood and mature writing style; generally correct spelling, grammar and punctuation ; smooth transitions					2	
Organization	Clear and focused message; logical progression of ideas				N/A	2	
Audience	Accessible to an average senior mathematics major at WOU				N/A	2	
TOTAL	(fully meeting all categories ~87% or B+)						/62

2008 WOU Senior Project Oral Presentation Scoring Guide

Presenter: ___________________________ Topic: ___________________________ Evaluator: ______________________________

Give an evaluation for each criterion[1] and an overall evaluation. HP = High Pass, P = Pass, N = No Pass
Summary data may be shared with the presenter, but individual evaluators will not be identified.

Evaluation Criteria	**High Pass Descriptors**	**Pass Descriptors**	**No Pass Descriptors**	**Evaluation**
Presentation shows the mathematical sophistication expected of a graduating senior.	Significant use of advanced mathematics.	Some use of advanced mathematics.	Little use of advanced mathematics.	
Shows understanding of the topic.	Shows thorough understanding of the topic.	Shows good understanding of the topic.	Shows poor understanding of the topic.	
Relevant concept definitions are clearly presented using proper notation.	Concept definitions stated <u>and written</u> clearly and correctly.	Concept definitions mostly stated and written clearly and correctly.	Concept definitions flawed or were not written.	
Relevant concept images are clearly conveyed.	Clear examples or analogies are given to convey the concept images.	Some attempt was made to convey the concept images.	Little attempt to convey the concept images.	
Included significant proofs.	Significant proofs were presented clearly and correctly.	Significant proofs were given, but were rough or had minor flaws.	Proofs were poorly done, incorrect, trivial or missing.	
Presentation shows good organization, pacing and advance preparation.	Presentation was well-organized, properly paced and appears to have been rehearsed.	Presentation had some small flaws in organization or timing, but appeared to have been rehearsed.	Presentation had major flaws in organization or timing.	
Presentation is creative and shows independence of thought.	Creatively presented in the speaker's own style.	Some creativity, but seemed somewhat bound to the style of the source materials.	Little creativity. Seemed to be simply reproducing what was in the source material.	

Overall Evaluation[2]: HP P N **Comments:**

[1] Based on the descriptors as stated, not on your own opinion.
[2] Based on the evaluator's own judgment, which can include factors not listed in the criteria.

Some things to remember:

- Pay attention to the criteria in the scoring guide.
- Write more on the board than you think you should. You can speak much faster than the audience can process and absorb what you are saying. Writing helps to control the pace, besides allowing the audience to refer back to a definition or theorem.
- Use handouts if you wish. They can be copied by the math department.
- Rehearse, rehearse. That is the only way to ensure that you have the proper amount of material.
- Think of ways to involve the audience in active learning.

WESTERN OREGON UNIVERSITY
MATHEMATICS DEPARTMENT EXIT INTERVIEW

Directions:
(1) Save this document in the Exit Interviews folder on the M drive using the name
<year> exit interview <number> where <number> is the next unused positive integer
e.g.,.2007 exit interview 3
(2) Go through the questions and type the student's responses. The student may remain anonymous.

Interviewer:
What led you to become a mathematics major?

What do you hope to do after graduation?

Did you know about or participate in these activities: (delete those that do not apply)

1. **giving a math talk outside class:** KnewAbout Participated
2. **Math Club math talks:** KnewAbout Participated
3. **Math Club career/grad school talks** KnewAbout Participated
4. **COMAP modeling competition:** KnewAbout Participated
5. **attending a math talk not at WOU:** KnewAbout Participated
6. **mathematics conferences:** KnewAbout Participated
7. **an REU or summer math program:** KnewAbout Participated
8. **internships or practica** KnewAbout Participated
9. **tutoring, paper grading, course TA** KnewAbout Participated

If you participated, were those valuable experiences? If not, why not?

What did you like and/or dislike about your experience as a mathematics major?

Were you advised well within the Mathematics Department, both academically and for your career path?

When comparing your experiences as a mathematics major with that of friends with other majors, have you heard of things that other departments do that you wish we did?

When comparing your experiences as a mathematics major with that of friends with other majors, are there things that we do that your friends wish their major's department would do?

Anything else you would like to add?

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BA, BS,

learning outcome **general education goal**

n ant, a snake, … an elephant? Math 394

se: Determine th … eter of two concentric circles

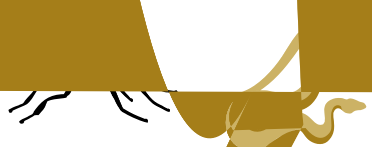
the main ques … :

s tied around ar … 6 feet is added to the rope.

nal can now … *Circular Object A?* The initial rope
ngth dependi … ct.

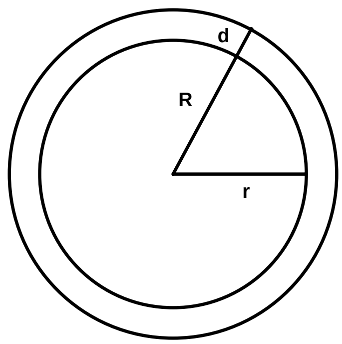
… cale)

Sna … Horse Elephant



ACTIVITY

Materials
String
Measuring tapes
Circular objects



R: radius of larger circle
r: radius of smaller circle
d = distance between two circles = R - r

Use string and physically measure the distance, d between the circular object and the rope with six feet added for each of the round object provided in class.

Record your solutions.

Follow Up
Measure the length of each string and use this circumference to determine the actual measures of r and R (as appropriate) for the circular objects you are measuring. Compute R – r = d in each case.

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learning outcome **general education goal**

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learning outcome **general education goal**

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learning outcome **general education goal**

- [x]
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✓
✓ *Teaching Children Mathematics.*
Mathematics Teaching in the Middle School.
✓

ALGEBRA PIECES / MODEL				EXPLANATION			
Excellent	**Partial +**	**Partial -**	**Poor**	**Excellent**	**Partial +**	**Partial -**	**Poor**
5	**4.5**	**4**	**3.5**	**3**	**2**	**1**	**0**

Appendix

LAS
Embedded Assessment Action Report Explanation
Michael Ward, Mathematics

Internally, the Mathematics Department uses a set of eight Extended Learning Outcomes instead of the edited set of three outcomes created for consistency in the Catalog. Our embedded assessment references our Extended Outcomes.

LEARNING OUTCOMES

1. Develop problem solving, modeling and technological skills.
2. Demonstrate ability to make rigorous mathematical arguments, work with axiomatic systems, and precisely articulate (both in writing and orally) complicated and technical arguments (both mathematical and logical).
3. Understand the distinction between applied and theoretical mathematics, the connection between the two fields, and the breadth of each field.

EXTENDED LEARNING OUTCOMES FOR MAJORS AND MINORS

Students will demonstrate:

1. Mathematical Knowledge—demonstrate mastery of a body of mathematics
2. Problem Solving Skills – the ability to analyze complicated problems in a variety of subject areas, and to synthesize solutions to such problems.
3. Modeling Skills – the ability to translate various real-world scenarios into mathematical models.
4. Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.
5. Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Including working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.
6. Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.
7. Subject Awareness – an awareness of the distinction between applied and theoretical mathematics, an appreciation of the connection between the two fields, and a reasonable perception of the breadth of each field.
8. Career Awareness – an awareness of the career and educational opportunities for mathematics majors; this many include internship and undergraduate research experiences.

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For

Program Review

Degree Program(s): BA/BS Mathematics (& some sciences)

Course # / Title: MTH 345 Ring Theory

Faculty name: Michael Ward

Date: 3 March 2008

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(MP) Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Including working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.

(CS) Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.

B) Check the embedded assessment tool(s) used :

- ☐ Exam question
- ☐ Essay
- X Oral presentation MP, CS
- ☐ Thesis
- ☐ Portfolios
- ☐ Practicum / Service Learning
- ☐ Capstone paper / project
- X Other “Capstone” homework exercise MK, MP, CS

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Oral presentation

These Mini-projects are to be presented in class. A rubric for assessment, compliments of S. Beaver, is on the back.

Schedule a meeting with Mike no later than three calendar days before your presentation to show what you plan to do. Check the timing of your presentation before the meeting.

Topic	Team	Date
Thm. 15.3 First Isomorphism Thm	Jenne, Michael	May 16
2nd and 3rd Isomorphism Thms. p. 339, problems 3,4	Amanda, Elizabeth	May 16
Thms. 14.3 and 14.4 p. 266-269	Andrew, Masaki	May 23
Exercise 50, p. 289 Find all the values of d where $\mathbb{Q}[\sqrt{d}] \simeq \mathbb{Q}[\sqrt{2}]$	Kim, Chris	May 23 (& 30?)
Suppose F is a sub eld of any eld K, $q \in K \backslash F$, and $q^2 \in F$. Prove $F[q] := \{a + bq : a, b \in F\}$ is a sub eld of K. Use that to nd the smallest sub eld of $\mathbb{R}$ containing $\sqrt{2}$ and $\sqrt{3}$	Rosco, Jason, Wesley	May 30

See rubric on next page.

"Capstone" homework exercise

Use the First Isomorphism Theorem to prove

- $\mathbb{R}[x]/\langle x^2 + 1\rangle$ is isomorphic to $\mathbb{C}$, if the last digit of your V-number is even.
- $\mathbb{Q}[x]/\langle x^2 - 2\rangle$ is isomorphic to $\mathbb{Q}[\sqrt{2}]$ (i.e. problem 40), if the last digit of your V-number is odd.

Presentation Scoring Guide and Rubric

Score / Evaluation Criteria	4	3	2	1	0	Weight	Possible points
Introduction - Effectiveness of your brief initial discussion of the content, scope, and flow of your presentation	Your introduction makes perfectly clear the salient points and scope of your talk	A bit too brief or missing an important item	Contains some relevant information but not nearly enough	Poorly worded or confusing introduction	No introduction	2	8
Logical Clarity - Your effectiveness in presenting your ideas without (uncorrected) logical flaws	No logical errors	One or two logical errors	Three logical errors	Four logical errors	Five or more logical errors	3	12
Subject Knowledge - Your ability to handle questions	You answer 90% or more of the questions fully and with appropriate elaboration	Your answer to 70%-90% of the questions was sufficient	Your answer to 40%-69% of the questions was sufficient	Your answer to 10%-39% of the questions was sufficient	Your answer to less than 10% of the questions was sufficient	4	16
Temporal Orgranization - To what degree your talk proceeded without jumping around between ideas, or filling in a detail which should have been provided earlier	All ideas presented in a logical, clear sequence	One unanticipated jump between ideas or filled-in missing detail	Two or three unanticipated jumps between ideas or filled-in missing details	Four or five unanticipated jumps between ideas or filled-in missing details	Six or more unanticipated jumps between ideas or filled-in missing details	3	12
Spatial Orgranization - Your blackboard technique and neatness; note that slides minimize your chances of scoring poorly here	Excellent use of space, obvious boundaries between ideas, clear and legible handwriting	One or two instances of cramming, poor handwriting, or unclear boundaries	Three or four instances of cramming, poor handwriting, or unclear boundaries	Five instances of cramming, poor handwriting, or unclear boundaries	More than five instances of cramming, poor handwriting, or unclear boundaries	3	12
Relative Pace - The appropriateness of the pace of your talk for yor audience	Ideal pace for the class, you pause when appropriate	Infrequent inappropriate pace, but you still check your audience frequently for apparent grasp	Several instances of inappropriate pace, but you still check your audience several times	Only a few instances of appropriate pace	Consistently too fast or too slow	2	8
Delivery / Eye Contact - How well you interacted with your audience	You speak to the audience, you almost never check your notes, and you spoke clearly	Good eye contact, but you return to your notes occasionally, or occasionally speak too quietly	Fair eye contact with your audience, but frequently return to your notes or speak too quietly	You are usually reading from your notes or speaking too quietly	No eye contact to speak of, or you're presentation was very difficult to hear	3	12
Mechanics - Spelling, grammar, punctuation, etc.	No errors	One or two errors	Three or four errors	Four or five errors	More than five errors	1	4
Creativity / Paraphrasing - The degree to which your talk was presented in your own style	Obviously you owned the presentation	Well-paraphrased with a few unnecessary exceptions	Some creativity, but you seem quite bound to the source material	Little creativity or paraphrasing	Presentation recited from the source material	2	8
Graphics - The relevance and clarity of your graphics (if you used, or should have used, any)	Graphics are clear, presented at appropriate times, and each reinforces or explains an idea in your talk	Good graphics, but some room for improvement in clarity, neatness, or relevance	Significant room for improvement	Poorly presented or some missing graphics	Confusing graphics, or no graphics when there should have been	2	8
						25	100

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Mathematics

Course # / Title: MTH 251 Calculus I

Faculty name: Michael Ward

Date: 3 March 2008

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(TS) Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.

B) Check the embedded assessment tool(s) used :

X Exam questions MK, TS
X Essay MK
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other ____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Exam Questions

Open book questions.

1. *(6 pts.)* Review the use of Maple's Differentiation Tutor.[1] Beginning in about 10 minutes, I will ask everyone, in random order, to show the step-by-step differentiation of a complicated function using the Tutor (without hints).

   Score: 6 5 4 3 2 1 0

2. *(10 pts.)* One of the following optimization problems will be assigned to you at random.

   - A cylindrical can of volume 355 cm^3 (the volume of a soda can) has closed ends. Call the radius of the can r and the total surface area of the can S. We are interested in S as a function of input r. Find the dimensions of the can with the smallest possible surface area, that is, the can that uses the least material.
   - Consider a box-shaped package with square ends. The US Postal Service will accept such a package if the sum of its length plus its girth is less that or equal to 108 inches. (The girth is the perimeter of the square end.) Let V be the volume of a package which just meets the post office requirement. Let s be the length of a side of the square end. We are interested in V as a function of input s. Find the dimensions of the box with the largest possible volume.

   Create a Maple document to show the solution of the problem. The solution must include the following items. *Save your document frequently.*

   (a) Enough explanation so that a person unfamiliar with the problem could easily follow the solution.
   (b) A formula for the function to be optimized and a plausible domain, with explanation.
   (c) Finding the critical numbers with Maple.
   (d) Locating the optimum value, using Maple to do the calculations (like test points, for example).
   (e) A summary fully answering the question.
   (f) Additional features (relevant graphs, etc.).

   When you are ready for me to evaluate your document raise your hand. Evaluation is based on the above items and the overall attractiveness of the document.

   Scoring Rubric.

12	enhanced and correct (2 bonus "quality points")
10	thoroughly developed and correct
8	complete and correct (with perhaps a very small imperfection)
6	partially complete or partially effective or partially right
4	underdeveloped, sketchy or wrong
2	ineffective, minimal or wrong
0	missing

[1]Maple is a computer algebra system for which WOU has a 20 user site license.

Closed book, no calculator questions.

1. Suppose $f(x) = \sqrt{3x^2 + 1}$.

   (a) *(4 pts.)* Find the linearization of f at input 1.

   (b) *(2 pts.)* What is the relationship between the linearization and $f(x)$ when x is near 1?

   (c) *(2 pts.)* Use the linearization to approximate $f(1.15)$.

2. Assume the number of students, S, enrolling at WOU is a function of amount, a (measured in thousands of dollars), of money spent on public relations. Suppose $S = g(a)$.

   (a) *(3 pts.)* What is the practical meaning of $g(100) = 5500$?

   (b) *(2 pts.)* Circle the most appropriate answer.

      i. WOU Public Relations hopes g is INCREASING DECREASING.

      ii. WOU Public Relations hopes the sign of g' is POSITIVE NEGATIVE.

   (c) *(3 pts.)* What is the practical meaning of $g'(100) = 20$, including the units?

Closed book; note card and calculator allowed questions.

1. Consider the function $f(t) = (t-2)(3t-1)^{2/3} + 1$.

   (a) *(4 pts.)* Find and simplify a formula for $f'(t)$. RAISE YOUR HAND; HAVE THE INSTRUCTOR CHECK YOUR FORMULA BEFORE PROCEEDING.

   (b) *(4 pts.)* Use the derivative to find exactly where f is increasing and where f is decreasing. Show your analysis carefully and answer carefully. The score is based mostly on the written analysis.

   (c) *(2 pts.)* Identify the local and global maximums and the local and global minimums, if any.

2. *(8 pts.)* Work *one* of the following problems, your choice.

   - A cup is made from a circular piece of paper by cutting a radius and forming a cone. Assume the radius of the paper is 8 cm. Find the largest volume such a cup can have. (The volume of a cone is $\pi/3 \cdot radius^2 \cdot height$.)
   - A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.

   (a) What quantity is to be optimized?

   (b) Make a sketch and label it by assigning variables to the quantities which change.

   (c) Derive a formula for the function to optimized. Eliminate all but one variable.

   (d) Give a plausible domain for the function to be optimized.

   (e) Now do the analysis to solve the problem. Show the work carefully and answer clearly.

Essay

1. One of the following topics will be assigned to you at random.

   - Explain, from a graphical point of view, why the slope of the tangent line to the graph of a function g at the point corresponding to input a is $\lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$ or $\lim_{x \to a} \frac{f(x) - f(a)}{x - a}$ (your choice, you only have to do one), assuming the graph has a tangent line at input a. Audience: A student who knows about limits, but knows nothing more about calculus.
   - Suppose $y = g(x)$ is a differentiable function. Explain, from a graphical point of view, the meaning of Δy and dy. Also explain when and why $\Delta y \approx dy$. Audience: A student who knows derivatives are slopes of tangent lines, but nothing else.

2. Write an essay on your topic.

   Essay checklist

   - ☐ Essay is directed at the specified audience.
   - ☐ The writing is low-context. That means it is not directed to someone, like the professor, who already knows the material and wants you to write a few lines to indicate you know approximately what is going on. Imagine you are writing a textbook.
   - ☐ The emphasis should be on *why* things are as they are and not just *what* they are or what to do.
   - ☐ The essay includes informative graphs.
   - ☐ Essay includes an example or sample problem along with a general discussion.
   - ☐ Proper grammar, spelling, sentence structure, paragraphing are used.
   - ☐ Essay is in your own words and style, not those from the text or from lecture.
   - ☐ Attach this sheet to your essay.

3. You are encouraged to bring a draft of your essay to office hours for feedback. (What a deal! I will help you get full credit.)

4. I hesitate to say anything about length, but 1 - 2 pages should be enough.

5. The essay may be typed, handwritten (very legibly!), or a combination of the two.

6. Collaboration: None allowed. You may use your text and your notes, but no other source of any kind. You may not have anyone help you except the instructor (or a consultant at the writing center).

The score will be based on the following guide. Ten points are possible on this essay.

12	enhanced and correct (2 bonus "quality points")
10	thoroughly developed and correct
8	complete and correct (with perhaps a very small error)
6	partially complete or partially effective or partially right
4	underdeveloped, sketchy or wrong
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