Mathematics Program
Southeastern Oklahoma State University

Assessment Report
2009-2010

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A. Departmental Mission Statement

The mission of the Mathematics Department at Southeastern Oklahoma State University is to prepare students to become teachers of mathematics, to enter graduate programs in the field of mathematics, to secure positions in business and government that require preparation in mathematics, and to satisfy the individual’s curiosity concerning the patterns of thought found within the body of mathematics. The programs in the Mathematics Department are based upon the philosophy that the study and application of mathematics requires the cultivating of thought processes and intellectual attitudes that are important and useful to all students in all academic disciplines. In keeping with this philosophy, the Mathematics Department provides courses for other academic programs and courses designed to fulfill general education requirements.

B. Departmental Vision Statement

The Mathematics Department at Southeastern Oklahoma State University will be the leading mathematics department for quality mathematics education among regional universities in Oklahoma and northern Texas.

C. Statement for Assessment and Student Learning

The Mathematics Department at Southeastern Oklahoma State University believes that assessment fundamentally contributes to student learning and that it is useful in all academic disciplines and extracurricular activities. The Mathematics Department will make appropriate changes to the Mathematics program as needed to ensure optimal student learning based on assessment results. In addition to curricular matters, assessment will also be used for program review, budgeting and planning and it will provide useful information to guide continuous program improvement.

D. Program Goals and Objectives

The goals or objectives of the Mathematics Program are to prepare mathematics majors at Southeastern Oklahoma State University (1) to enter graduate programs in the mathematical sciences; (2) to secure positions in business and government that require preparation in mathematics; and (3) to advance intellectual development concerning the patterns of thought found within the body of mathematics. These goals are realized through specific program outcomes as listed below.
E. Major Program Outcomes

A student completing a B.S. degree in Mathematics shall be able to:

1. Demonstrate a comprehension of calculus techniques and concepts.

2. Use mathematical reasoning to write valid, complete, well-expressed proofs.

3. Demonstrate a comprehension of concepts in linear and abstract algebra.

4. Connect different areas in mathematics, use several steps of reasoning, or absorb and apply new concepts readily.

5. Apply mathematical concepts to other disciplines.

6. Evaluate and utilize appropriate technology in solving mathematical problems.

7. Manifest oral and written communication skills in the presentation of mathematical topics.

8. Obtain a job utilizing their degree or be admitted to graduate school.

F. New to this Year’s Assessment Report

As a result of the Institutional Assessment Committee’s report on the 2008-2009 Assessment Report and ongoing departmental and university conversations on assessment we have made the following changes:

- We have eliminated an assessment of Outcome 6 which used student grades.
- We have eliminated the alumni survey because the administering agency (the Educational Testing Service) terminated that service and the university has not yet found an alternative.
G. List of Assessment Tools

Below is a list of the assessment tools used in this report, followed by the section in this report in which the analysis occurs.

1. ETS Exam Calculus Indicator: H.1a.
2. GRE or ETS Practice Exam: H.1b and H.3b.
5. ETS Exam Nonroutine Indicator: H.4a.

H. Assessment of Each Objective and Outcome

1. Comprehension of calculus

Objective #1 is Demonstrate a comprehension of calculus techniques and concepts. This objective is assessed via the following instruments.

a) ETS Exam Calculus Indicator

Each student majoring in Mathematics is required to take the ETS Major Field Achievement Examination in Mathematics. It is administered to all seniors in the Senior Seminar course. Scores are compared to national averages.

Two mathematics majors enrolled in Senior Seminar this year and took the test. One mathematics education major also took the test, and there is no way to separate the data from the math majors. The chart below shows how our math and math education students have scored on the calculus portion of the ETS exam over the last five years. In 2007-08 no math majors took the exam.
Calculus Subscores: Percent correct

<table>
<thead>
<tr>
<th>Year</th>
<th>Southeastern</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-04</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>2004-05</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>2005-06</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>2006-07</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>2007-08</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2008-09</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2009-10</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

Modifications: Data indicates that Southeastern students are performing close to the national average (especially in the last two years), and no modifications are necessary at the present time.

b) GRE or ETS Practice Exam

This was the fourth year in which each student majoring in Mathematics was required to take a Graduate Record Examination (GRE) or Educational Testing Service (ETS) practice exam, which contains specific questions to test students' comprehension of calculus techniques and concepts. The exam is given in the Senior Seminar course and there were two Mathematics majors who took the test this year.

Questions on the version of the practice exam given in the course were representative of material covered in the standard 10 hour calculus sequence taken by Mathematics majors at Southeastern. The scores are listed below.

Student 1: 50 (first attempt); 100 (second attempt); average score of 75 used.
Student 2: 100

The scores were great, although Student 1 had to re-do the calculus problems before mastering the solutions.

Scores since the requirement was instituted are summarized in the chart below. In the Spring 2008 semester we had no Mathematics majors in Senior Seminar, so there is no data for this assessment that year.
Modifications: Data from the practice GRE/ETS does not suggest that any modifications to the program should be made at this time.

2. Proof-writing

Objective #2 is *Use mathematical reasoning to write valid, complete, well-expressed proofs*. This objective is assessed via the following instruments.

a) Proof Analyses

Students who take and pass Math 3283: Foundations of Mathematics are expected to be able to construct and express mathematical proofs. The three fundamental areas of focus for proofs are logical correctness, mathematical completeness and verbal expression.

Proofs are evaluated and graded on a 5 point scale for each of these three fundamental areas. Each student who has passed Foundations of Mathematics will have proofs analyzed from this course. A student will be determined to be competent in their ability to construct and express
proofs if at least one of the randomly chosen proofs receives, at minimum, a score of 12 out of 15, with the requirement that no one area (logical correctness, mathematical completeness, and verbal expression) receive a score less than 3. Thus, there will be no averaging of results used in the assessment. If a particular student does not meet the criteria for competency in the Foundations course, they will be evaluated in each course for which Foundations is a requirement until one of the following two outcomes has occurred: The first outcome is that the student meets the criteria for competency in the proof making process. In this case, the student will be classified as competent in the overall analysis. The second outcome is that the student graduates without receiving a passing evaluation on any of the proofs examined in the subsequent courses. In this case, the student will be classified as not competent in the overall analysis. This method of determination of competency, together with the choice of using all students who have passed Foundations, will give an accurate assessment of our ability as a department to teach students the concepts required for them to construct and express mathematical proofs.

For the 2009-2010 academic year, proofs from only one student were analyzed. One proof from this lone student satisfied the required criteria to be assessed as competent in proof writing skills, with a perfect score of 15. With only one proof, even with a passing score, it is difficult to make any truly meaningful assessment; however a passing perfect score is preferable to a non-passing score. A distribution of scores from the past 5 years can be seen in the figure below.

Since this method of proof assessment was put into place, a total of 21 students have had their proofs analyzed. The two students who did not have proofs which passed the required criteria have since graduated. The remaining 19 student’s proofs met the criteria established, showing that they had the ability to construct and express mathematical proofs. Furthermore, since the scores of the proofs are distributed more towards the high end (see figure below), we can conclude that not only can these students construct proofs which possess the bare minimum qualities required to achieve a score of passing, but many of them can construct proofs to a high degree of competency.
This assessment tool has now been in effect for six years, and it clearly shows that our department is adequately teaching students the concepts required to construct and express mathematical proofs.

**Modifications:** Data from the analyses of proofs does not suggest that any modifications to the program should be made at this time.

### 3. Linear and abstract algebra

Objective #3 is *Demonstrate a comprehension of concepts in linear and abstract algebra*. This objective is assessed via the following instruments.

**a) ETS Exam Algebra Indicator**

Each student majoring in Mathematics is required to take the ETS Major Field Achievement Examination in Mathematics. It is administered to all seniors in Senior Seminar course. Scores are compared to national averages.

This past year we had two math majors plus one math education major take the ETS exam. There is no way to separate the data by major. In three out of six years the mean percent correct for our students is greater than the national mean percent correct. In 2007-08 no math majors took the exam.
Modifications: Data from the ETS exam in algebra indicates no need for program modifications at this time, but we do notice the downward trend in algebra scores. We do not believe the trend to be statistically significant at this time. Small numbers of students taking the exam will result in great variability in the scores.

b) GRE/ETS Practice Exam

This was the fourth year in which each student majoring in Mathematics was required to take a Graduate Record Examination (GRE) or Educational Testing Service (ETS) practice exam, which contains specific questions to test students’ comprehension of abstract and linear algebra. The exam is given in the Senior Seminar course and there were two Mathematics majors in Senior Seminar this year.

This was the fourth year we have been using this assessment instrument. In the Spring 2008 semester we had no Mathematics majors in Senior Seminar, so we had no data for this assessment that year.

On the version of the practice exam used this year there were questions that were representative of the material covered in Linear Algebra, but there were no questions that were representative of the material covered in Abstract Algebra. Scores are summarized below.

<table>
<thead>
<tr>
<th></th>
<th>Linear</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1:</td>
<td>100</td>
<td>(N/A)</td>
</tr>
<tr>
<td>Student 2:</td>
<td>100</td>
<td>(N/A)</td>
</tr>
</tbody>
</table>
Questions on these exams are fairly difficult, as they are often used to determine how prepared students are to enter graduate school in mathematics.

Mean Percent Correct on the GRE/ETS Practice Exam
Linear and Abstract Algebra Problems

<table>
<thead>
<tr>
<th>Year</th>
<th>Linear Algebra</th>
<th>Abstract Algebra</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>2007-08</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>2008-09</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>2009-10</td>
<td>70</td>
<td>80</td>
</tr>
</tbody>
</table>

Modifications: Data from the GRE practice exam in algebra indicates no need for program modifications at this time.

4. Connect areas, use several steps, or apply new concepts

Objective #4 is Connect different areas in mathematics, use several steps of reasoning, or absorb and apply new concepts readily. This objective is assessed via the following instruments.

a) ETS Exam Nonroutine Indicator

Each student majoring in Mathematics is required to take the ETS Major Field Achievement Examination in Mathematics. It is administered to all seniors in Senior Seminar course. Scores are compared to national averages. Group assessment for forming connections, using several steps of reasoning, or applying new definitions or concepts is reported by the ETS.
Approximately 25 percent of the ETS Major Field Test in Mathematics has to do with questions based on the Nonroutine Assessment Indicator, which “includes all items that are considered insightful”. (ETS website) It also “includes items that require several steps of reasoning and items that require either the use of several definitions or a ‘new’ definition which the student would not be expected to know. Some questions may require bringing techniques from two or more areas to bear on one problem, e.g., treating functions from calculus as elements of an algebraic system.” (ETS Website)

Assessment Indicator scores are reported as a whole rather than by individual student, so there is no way to separate the results by major. In the Spring of 2010, two Mathematics majors and one Mathematics Education major took the exam. The bar chart below reflects how this group of students did on the Nonroutine Assessment Indicator portion of the 2010 exam, as well as a comparison of scores for the previous five years. In 2008 no math majors took the exam.

ETS Major Field Scores in Mathematics: Nonroutine Assessment Indicator

It seems evident from the chart that scores in the Nonroutine Assessment Indicator have been improving over the years.

Our students had a mean score of 39 in 2007, which is at the 95th percentile nationally. A score of 28 is at the 50th percentile, and our students had a mean score of 28 this year.

Modifications: Data indicates no need for program modifications.
5. Apply mathematical concepts

Objective #5 is *Apply mathematical concepts to other disciplines*. This objective is assessed via the following instruments.

**a) ETS Exam Applied Indicator**

Each student majoring in Mathematics is required to take the ETS Major Field Achievement Examination in Mathematics. It is administered to all seniors in Senior Seminar course. Scores are compared to national averages.

Approximately 20% of the ETS Field Test in Mathematics has to do with questions based on the Applied Assessment Indicator, which includes all “real world” problems but not those that use one area of mathematics to solve a problem in another area of mathematics.

Two mathematics majors and one mathematics education major took the exam Spring 2010. There is no way to separate the results by major.

![ETS Major Field Scores in Mathematics](image)

**Modifications:** Data indicates performance might be dependent upon the availability of applied course offerings; given more math majors, applied course offerings could be offered on a regular basis. Program faculty have met to discuss this but so far we have not found a way to offer applied course offerings for our low numbers of majors. Our program reviewer has suggested that the university hire a new faculty member to support Southeastern’s pre-engineering program, and the Mathematics Department will follow up on this recommendation.
b) National Competitions

Participation and performance in national contests such as the Mathematical Contest in Modeling (COMAP) are examined and evaluated. This academic year our students decided against forming a COMAP team, and instead attended a conference for undergraduate math majors.

6. Technology

Objective #6 is *Evaluate and utilize appropriate technology in solving mathematical problems*. This objective is assessed via the following instrument.

a) Senior Seminar Presentations

We realize that class grades cannot provide a complete assessment of any outcome, and so in Spring 2009 we implemented a new assessment instrument to assess students' abilities to evaluate and utilize appropriate technology in solving math problems. We decided to analyze the projects assigned in Senior Seminar. These projects are not required to utilize technology in any way. Rather, we asked the following questions about each of the projects: (1) *Could technology have been used to enhance the solution to a math problem in the research project?* (2) *Did the student use appropriate technology in the solution to a math problem in their research?*

Below are the results for the students in Senior Seminar.

<table>
<thead>
<tr>
<th>Student</th>
<th>Question (1)</th>
<th>Question (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1 '09</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student 2 '09</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Student 3 '09</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Student 1 '10</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Student 2 '10</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Modifications:** Since every student used appropriate technology as needed, no program modifications are indicated by this assessment.

7. Communication in presentation of mathematics

Objective #7 is *Manifest oral and written communication skills in the presentation of mathematical topics*. This objective is assessed via the following instruments.
a) Senior Seminar Project

Each student in Senior Seminar is assigned a research project with a written component and an oral presentation component. A mathematics faculty member not teaching the course evaluates the project for this assessment report.

Three mathematics majors took the Senior Seminar course in the 2009-2010 academic year. Each student was required to write a research paper and give a 25 minute presentation of their research. Research papers were to contain significant mathematical content and at least some material that was new to the student. Topics were chosen by the students with the approval of the instructor.

Each project was evaluated on depth and correctness of mathematical content, clarity of exposition, and presentation. Each category was scored as target, acceptable, or unacceptable. The results are tabulated below.

<table>
<thead>
<tr>
<th>Student 1 '09</th>
<th>depth</th>
<th>correctness</th>
<th>exposition</th>
<th>presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 2 '09</td>
<td>target</td>
<td>acceptable</td>
<td>acceptable</td>
<td>target</td>
</tr>
<tr>
<td>Student 3 '09</td>
<td>target</td>
<td>target</td>
<td>target</td>
<td>target</td>
</tr>
<tr>
<td>Student 1 '10</td>
<td>target</td>
<td>target</td>
<td>target</td>
<td>target</td>
</tr>
<tr>
<td>Student 2 '10</td>
<td>acceptable</td>
<td>target</td>
<td>target</td>
<td>target</td>
</tr>
</tbody>
</table>

Comparative data with last 5 years: This is the second year that this rubric has been used to assess the project, so not much comparative data is available. We implemented this rubric last year so that comparisons from year to year can be made.

Modifications: No program modifications are indicated by this assessment.

8. Obtain a job

Objective #8 is Obtain a job utilizing their degree or be admitted to graduate school. This objective is assessed via the following instruments.

a) Alumni Data

Records are kept for graduates of the Mathematics program. These records are used to evaluate whether our graduates obtain a job utilizing their degree or are admitted to graduate school.
Since the Fall of 2005, we have had 15 Mathematics graduates. It has been a couple of years since we have heard from a few of them, but we have at least some knowledge as to what they are all doing or at least were doing when last we heard. Of the 15, 6 are teaching mathematics at some level: 1 in the learning center at SOSU, 2 at high schools in Oklahoma (one of which is also working on a math specialist degree at SOSU), 2 at high schools in Texas, and 1 at a middle school in Oklahoma. Three others are going, or plan to go, to graduate school (1 is in graduate school in mathematics at UNT, and 2 were planning to start graduate school in 2010 but we have not heard for sure if and where they did). Of the remaining graduates, 1 works for Choctaw Nation, 1 is a small business owner, 1 works in industry in Virginia, 1 works for the Social Security Administration and 2 are unemployed by choice. From the above data it seems that our students are able to obtain a job utilizing their degree or be admitted to graduate school; whether or not they choose to do so is another matter.

**Modifications:** No program modifications are indicated by this assessment instrument.

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**I. Program Faculty**

Mathematics Program faculty include:

- Brett Elliott
- Karl Frinkle
- Layne Heitz
- Linda Kallam
- Charles Matthews
- Chris Moretti
- Buddy Pierce
- Patrick Reardon

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**J. Faculty Level of Involvement in Assessment Process**

All faculty members in the Mathematics Department will be involved in the collecting and analyzing of data and in the writing and proofreading of the assessment report. In addition to the editing and proofreading of the entire document, the following is a list of responsibilities for academic year 2009-2010. Responsibilities change annually depending on who is teaching Senior Seminar.

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brett Elliott</td>
<td>collect data and write Section H.8</td>
</tr>
<tr>
<td>Karl Frinkle</td>
<td>write Section H.2, collect data from Senior Seminar</td>
</tr>
<tr>
<td>Layne Heitz</td>
<td>proofread the report, make recommendations</td>
</tr>
<tr>
<td>Linda Kallam</td>
<td>proofread the report, make recommendations</td>
</tr>
<tr>
<td>Charles Matthews</td>
<td>compile report, organize faculty responsibilities</td>
</tr>
<tr>
<td>Chris Moretti</td>
<td>proofread the report, make recommendations</td>
</tr>
<tr>
<td>Buddy Pierce</td>
<td>proofread the report, make recommendations</td>
</tr>
</tbody>
</table>
K. Constituents and Stakeholders

The constituents and stakeholders relevant to the Mathematics Program are: (1) the various graduate schools and employers of our graduates; (2) our faculty; and (3) our present, past, and future students.

(1) We make every attempt to keep up with how our graduates are doing in graduate school and we communicate annually with mathematics graduate directors at OSU and OU. Assessment data including results of the ETS exams, Senior Seminar projects, conference presentations, national exams and modeling competitions are shared with graduate directors from OSU and OU. Feedback is regularly requested and has been received from OSU and OU concerning the success of our recent graduates. All feedback from OU has been extremely favorable; the graduate director there sends Southeastern’s Chair of Mathematics regular emails and letters asking us to send them more of our talented alumni. There has been only one case of one of our graduates at OSU who was not seen as successful, but this was wholly due to a personality conflict with a particular research professor there; this professor had previously commended the student and the student left OSU and received a Ph.D. from a Texas school this year. Feedback from graduate schools indicates no need for program modifications at this time.

It is extremely rare for more than one of our graduates to be employed by the same employer, but our alumni surveys indicate the success of our graduates in the workforce. Alumni from the Mathematics Program include: two university presidents; five university administrators; seven university academic chairs; twelve professors of math, engineering, statistics, physics or computer science; high school math teachers; an insurance statistician; mathematicians or engineers at Raytheon, MEMC, Sandia Labs, Microsoft, and International Quantum Epitaxy; and navy and army officers.

(2) All Mathematics faculty are involved in writing or proofreading the assessment report as the above section demonstrates. Feedback is received from faculty during this process.

(3) Our present students are well aware of our assessment data, as it is shared with them as we get the results. Most of the feedback from our present students is received in Senior Seminar, when our students have one more chance to review mathematical material after the results on the ETS exam. Our past students are contacted via email regularly, and one of our graduates was selected this year to receive the Distinguished Alumni Award. Our future students see some assessment data in our recruiting materials. Feedback from future students is mostly indirect; it is unclear how recruiting materials affect our prospective students, since many prospective students are never seen again.

L. Assessing IETV and/or Web-Based Instruction

There are no IETV or web-based or hybrid courses offered in the Mathematics Program.
Some mathematics courses are offered online, but these are not in the Mathematics Program. Most of these courses are assessed in the Mathematics Department’s General Education Assessment Report.

**M. Strengths and Weaknesses of the Program**

From the data presented in this report, it seems that our Mathematics Program is strong in all areas except one. Our biggest strength is in our fulfillment of Objective #4: *Connect areas, use several steps, or apply new concepts* (see Section H.4). The weakness is in the area of applying mathematics to other subjects (see Section H.5). Offering more applied courses is problematic because of the low numbers of majors in Mathematics. The department plans on requesting a new faculty member to support the university’s pre-engineering program. Not only would this position bring in new majors, but it would also help us to strengthen our applied mathematics offerings. This idea was recommended by our external program reviewer.

**N. How Modifications are to be Made**

When assessment results indicate a need for a change in the Mathematics Program, the Mathematics Department as a whole will meet and discuss what changes are needed. Appropriate changes will be made and forwarded to the necessary entities for final approval (e.g. the Curriculum Committee, Board of Regents, etc.). These changes will allow the department to improve the Mathematics Program, plan for the future, and request budget modifications as necessary based on assessment results. Additionally, assessment will sometimes occur in other ways. For example, an individual instructor may make changes in their course based on their own personal experience. Also, modifications in the assessment plan will occur annually, as assessment reports are reviewed by faculty and the Institutional Assessment Committee (IAC). Modifications in the assessment plan will be the direct result of assessment reports from the previous years, or suggestions from the IAC or the Director of Assessment.

**O. Effectiveness of Previous Modifications**

The Mathematics Department proposed a change in the degree requirements for the Bachelor of Science degree in Mathematics in the 2002-2003 academic year. The change was approved. We dropped Analytic Geometry from the requirements and added a requirement of a two-semester sequence in Analysis, Probability or Abstract Algebra. This decision to change the requirements was based on assessment from previous years, suggestions from students and alumni, and the recommendations published in the *Committee on the Undergraduate Program in Mathematics Curriculum Guide*, a report by the Mathematical Association of America.

All assessment data since 2002 indicates that the change in program requirements was successful.
In the 2003-2004 Assessment Report we found that we should try to find ways to reduce inconsistency in adjunct instruction. The chair of the department began collecting exams from all adjunct instructors and gave directions to instructors who deviated from appropriate or standard policies. The chair began visiting adjunct-instructed classes, and wrote up a “Classroom Visitation Report” on each class visited, detailing instructional techniques and suggestions for improvement. Although these changes were reducing the inconsistency in adjunct instruction, they added to the workload of the chair to an extent such that a continuation was difficult. In the 2005-2006 academic year regular faculty began visiting classes taught by adjuncts and writing up Classroom Visitation Reports. Inconsistency has been further reduced. We note that our adjunct instructors do not teach any of the courses in our math program, but they do teach the prerequisites for these courses.

P. Modifications to be Made to the Program or the Assessment Plan

It seems as though our program is doing well. Somewhat recent changes have occurred to the Mathematics Program (see Section O). These changes seem to have been effective, and members of the Mathematics Program Faculty feel that the only change to the program we can recommend at this time is the hiring of a new faculty member to support our almost non-existent pre-engineering degree. This position will hopefully increase the number of Mathematics majors and improve our ability to achieve Objective #5 on applying mathematics to other disciplines.

Q. Signatures

Chair of Mathematics: Charles A. Matthews

Dean of Arts & Sciences: [Signature]

RECEIVED
SEP 08 2010
Dean’s Office
School of Arts & Sciences