Bergen Community College

ASSESSMENT REPORT FORM FOR ACADEMIC PROGRAM

Assessment Period: 2014-2016

Department/Program: Mathematics

Department Chair: Dr. Randolph Forsstrom

Department Assessment Liaison: Professor Lenore Lerer

Date Submitted:

- **Program Description or mission/goal statement of the Department/Program**:

MISSION STATEMENT

The mission of the Mathematics Discipline is to promote excellence in the teaching and learning of mathematics by:

- offering a broad selection of courses that are designed to meet diverse student needs.
- providing students with an awareness of the connections of mathematics to other subjects and to strengthen each student's ability to apply mathematics to these subjects.
- promoting critical thinking through course work that emphasizes problem solving and applications.
- introducing students to the effective uses of technology in mathematical problem solving.
- promoting scholarly activity among all of the mathematics faculty and students majoring in mathematics.
- encouraging and supporting faculty collaboration with colleagues from other disciplines to modify and develop mathematics courses that support other programs of study.

The Mathematics Discipline serves a diverse population that includes students:

- who are majoring in mathematics in order to pursue a career in teaching or in the private sector.
- from other majors who need to acquire mathematical skills in order to be successful in their major.
- who, as part of their general education, need to acquire the ability to think critically, reason logically, communicate mathematical information, and do problem solving in a systematic manner in order to become more productive citizens.

Program Learning Goals/Outcomes: **Mathematics Program Objectives**

Upon successful completion of the A.S. Degree in Mathematics, the student will be able to:

1. Understand the fundamental concepts of functions and relations, be able to work with function notation, and understand how functions are used to represent real-world applications.
2. Work with formulas, including formula evaluation and solving a formula for any of the variables.
3. Construct labeled graphs of functions to accurately convey information.
4. Solve equations involving algebraic functions, exponential functions , logarithmic functions, trigonometric functions, and derivatives of functions.
5. Apply various mathematical techniques to obtain approximate solutions to problems for which an exact solution is not possible or easily obtained.
6. Apply the techniques of both differential calculus and integral calculus to problems involving functions of both one and several variables.
7. Construct a mathematical model of a real-world problem, translate the model into a mathematical problem, determine the solution(s) of the problem and interpret the solution(s) both mathematically and in real-world terms.

8. Apply mathematics to the solution of problems from other disciplines.
9. Communicate effectively using mathematics by employing proofs to validate properties and arguments involving various theorems and properties in mathematics.
10. Derive other mathematical properties from a given set of mathematical properties or axioms.

SEMESTER 1: CREATING PROGRAM-LEVEL ASSESSMENT PLAN

1. **Program Learning Goal(s) or Outcome(s) to be assessed (from the above section):**

   Understand the fundamental concepts of functions and relations, be able to work with function notation, and understand how functions are used to represent real world applications.

2. **Means of Assessment:**

   We will be studying 4 problems from the departmental final examination that relate to the above program goal.

   - **Feedback from Dean: '**Overall, I think this will have a very reasonable assessment study. It would be an even more interesting study, if these problems were similar to ones used in the preliminary exams, and we could measure the changes in the targeted competences from the primary to the final exam'.

SEMESTER 2: DEVELOPING ASSESSMENT TOOL (s) and TIMELINE

3A. Describe or attach assessment tool (s), including sources of data, timeline for data collection and how data will be analyzed.

We will be collecting student scores (and examples of student work) from problems 1, 3, 17, and 18 on the final exam over 2 semesters (spring 2015 and fall 2016). Scores will be summarized and analyzed.

3B. Desired results faculty would like to see.

We will be looking for a score of at least 70% on each problem. Significant deviations from the 70% goal will result in a discussion within the department about changes to improve student success.

- **Feedback from CIE:**

SEMESTER 3: COLLECTING AND ANALYZING DATA

4. Summary of Results (attach aggregated data table, survey tool, etc., to support the summary)

We collected data from almost 600 students. The results are summarized here:

mean	3.18	3.62	3.04	2.27
Standard deviation	1.99	1.79	1.87	1.96

Question #1) 64%

Question #3) 72%

Question #17) 61%

Question #18) 45%

(Note: Samples of students' work will be scanned and attached).

Clearly, the goal of 70% was not met. In analyzing the errors, it is clear that student have the most difficulty in the following areas:

1) Some students are required to put answers in interval notation, while others are required to write the answer in inequality notation. They seem to have less difficulty with inequality notation than with interval notation.

2) Finding the inverse of a function is problematic. The process involved is not completely mastered.

3) The concept of domain as it relates to radicals is also an area of difficulty.

5. Recommendations for Improvement:

The following recommendations came from some of the faculty involved in the assessment project:

a) I think that for the most part the trouble students could be having with these problems lies less with the concepts involved, than with the algebraic machinery that must be employed. For instance, with respect to problem 18, this problem asks to find the inverse of a function. Now the concept involved would be that for any one-one function, that function has an inverse that exists,----but finding that inverse (at least the one in problem 18) could involve "moving terms", collecting several occurrences of the variable, then factoring that variable so that there is only one occurrence, then finally dividing. Also with respect to finding inverses, when the initial variable "switch" is done for the "new y", perhaps placing a tick mark on that new y will remind students to change it at the end of the process to inverse function notation. Students need to really sharpen their algebraic machinery skills.

With respect to the concept of the domain of a function, perhaps suggesting that a function is a sort of machine that "runs" on domain values which crank-out function values (y-values--which students have to be reminded they are); and that certain values (restricted values) with certain functions shut down the machine--so are not allowed.

b) 17 and 18 are evaluating functions (difference quotient) and finding the inverse. If we include more applications involving functions our students may better understand what they mean, especially by the domain of the function.

c) The dean's suggestion that we measure the changes in the targeted competences from the primary to the final exam is a very reasonable one. Perhaps more reinforcement over the course of the semester would be indicated.

- **Feedback from Dean:**

SEMESTER 4: CLOSING THE LOOP AND SHARING KNOWLEDGE

6. Use of Results:

At the end of the spring semester 2016, a meeting will be held of all faculty teaching MAT 160 Intermediate Algebra to discuss implementing these (and future) recommendations beginning with the Fall 2016 semester.

Will you make any changes to how the topics are taught? Will there be any workshops for faculty, especially adjuncts? Will extra help be available for students or faculty?

- **Feedback from CIE:**