CENTRAL NEW MEXICO COMMUNITY COLLEGE
ASSESSMENT REPORT
Due to SAAC by October 15

PART 1: CONTACT & PROGRAM IDENTIFICATION

Report Year and Contact Information:			
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Academic Year	**Contact Person**	**Email**	**Phone Number**

Subject of this Assessment Report:		
Program: Mathematics	**Gen Ed Area:**	**Discipline Area**:
☐ Certificate ☐ AA ☒ AS ☐ AAS	Applicable to: ☐ AA/AS ☐ AAS	

PART 2: EVIDENCE OF ACHIEVEMENT OF PROGRAM OUTCOMES

Summary of Program Success in Achieving Desired Outcomes:

Academic year 2014/15 was the inaugural year of assessing MATH 1710 Calculus I and likewise assessing the Math Degree program itself. The Math Degree, consisting of six Program-Level SLO's, was assessed only on Program-Level SLO#1 for AY2014/15. Three assessment questions, targeting two MATH 1710 Calculus I Course-Level SLOs, were implemented. Necessarily, these three questions target Program-Level SLO#1.

The Math Department met with limited success across the two course-level SLO's. During Fall 2014, student performance on all three assessment questions did not meet the benchmark of 2.00. Spring 2015 yielded better results, with Q1 and Q2 exceeding the benchmark, but with Q3 again not meeting the benchmark. Thus there is evidence that student performance on solving optimization problems is in need of improvement. The other two assessed questions, having mixed performances between semesters, need additional semesters of data to be actionable.

Description and Evaluation of Recent Changes Made in Support of Student Learning:

Academic year 2014/15 is the first year of assessing the Math Degree (and of MATH 1710 Calculus I) and as of yet no changes have been made to pedagogy. The Math Department will formulate a strategy to address the deficiency in student performance on optimization problems. It does seem possible that the observed weakness with optimization problems is an anomaly and/or attributable to faculty unfamiliarity with assessment.

PART 3: REPORT ON RECENT ASSESSMENT OF STUDENT LEARNING PROCESSES

Learning Outcome(s)/Exit Competencies Assessed: *To add rows: right –click in cell below and select "Insert," "Insert Rows Above"*	**Classes/Cohorts Assessed:**
1. Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization.	MATH 1710

Measurement Tool(s) Used: *To add rows: right –click in cell below and select "Insert," "Insert Rows Above"*	*Enter X's for type of tool*				**Initial Achievement Target or Expectation:**
	Internal	**External**	**Direct**	**Indirect**	
Standard Test Questions	X		X		Average score of 2.0 on rubric whole number scale {0, 1, 2, 3}

Assessment Results/Findings:

Math Degree SLO#1 – MATH 1710 Calculus I – Standard Test Question 1

Find the limit.

$$\lim_{x \to 0} \frac{1 - \cos x}{x^2}$$

Numerical Assessment Problem #1	**0**	**1**	**2**	**3**
Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	$\frac{1}{2}$

Fall and Spring mean rubric scores on Question 1 were 1.97 and 2.43, respectively. The distributions could not be tested for differences.

Math Degree SLO#1 – MATH 1710 Calculus I – Standard Test Question 2

Find the limit.

$$\lim_{x\to\infty}\left(\sqrt{x}-1\right)^{\frac{1}{\sqrt{x}}}$$

Numerical Assessment Problem #2	0	1	2	3
Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	1

Fall and Spring mean rubric scores on Question 2 were 1.77 and 2.07, respectively. The distributions differ statistically between Fall and Spring.

Math Degree SLO#1 – MATH 1710 Calculus I – Standard Test Question 3

A cylindrical can is to be made to hold 1 m^3 of oil. Find the dimensions that will minimize the cost of the metal to manufacture the can.

Numerical Assessment Problem #3	0	1	2	3
Answer	Not answered or non-mathematical 'attempt'	Mathematical attempt but major conceptual or calculational error	Mathematical attempt with minor conceptual or calculational error	radius $\frac{1}{\sqrt[3]{2\pi}}$ m and height $\sqrt[3]{\frac{4}{\pi}}$ m

Fall and Spring mean rubric scores on Question 3 were 1.61 and 1.75, respectively. The distributions do not differ statistically between Fall and Spring.

Analysis and Interpretation of Assessment Results/Findings:

During AY2014/2015, 113 students were assessed in MATH 1710 Calculus I, with 69 and 44 students arising from the Fall and Spring semesters, respectively. No students were permitted to use notes of any kind during assessment. All students were assessed during the final exam. During the Fall, 48% of students were permitted to use a calculator during assessment while 100% of students were permitted during the Spring.

Two Calculus I Course-Level SLO's, SLO#1 and SLO#3, targeting Math Degree Program SLO#1, were assessed through three assessment questions (see table 1.) For the Fall semester, student performance did not meet the benchmark of 2.00 for any of the assessment questions. In contrast, student performance exceeded the benchmark on two of the three assessment questions, Q1 and Q2, for the Spring semester. There appears to be a need to improve student performance on optimization problems, as it was the only assessment question that did not meet the benchmark during either semester. The other assessed questions, having mixed performances between semesters, need additional semesters of data to be actionable. The assessment results are summarized in Table 1 below.

Table 1. Mean rubric scores of assessment questions AY2014-2015 by Course-Level SLO and Component. All assessment questions target Math Degree SLO#1.

SLO#1: Compute limits		Fall	Spring
3) Compute limits using limit laws and algebraic techniques	Q1‡	1.97	2.43
4) Compute limits involving infinity	Q2†	1.77	2.07
SLO#3: Write mathematical explanations using appropriate definitions and symbols		Fall	Spring
10) Solve optimization problems	Q3	1.61	1.75

†Statistically significantly different distributions between semesters (not necessarily different means)

‡Data too sparse to statistically test

Action Plan in Support of Student Learning:

The Math Department, having discovered a weakness in student performance on optimization problems, is still formulating a strategy of redress. It is likely that faculty will direct more attention toward instruction on optimization problems. A further possibility is to modify the Calculus I syllabus to emphasize optimization problem coverage, reminding faculty of the issue. Since it is the inaugural year of assessing Calculus I, it is also possible that the observed weakness with optimization problems is an anomaly and/or attributable to faculty unfamiliarity with assessment.

Recommendations, Proposals, and/or Funding Requests:

PART 4: EMBEDDED OUTCOMES

Critical Thinking and Life Skills/Teamwork Development within Programs: a) Please describe how Critical Thinking assessment is embedded within your program assessment. b) Please describe how Life Skills/Teamwork assessment is embedded within your program assessment.
a) Critical thinking assessment is embedded most substantially in the assessment of SLO 4, as students must take an holistic, comprehensive approach in both strategizing solutions and reflecting upon the implications of the solutions. The other assessed SLOs also include critical thinking albeit to a somewhat lesser degree.
b) Life Skills/Teamwork assessment is also substantially embedded in the assessment of SLO 4, in which students must progress through the assessment tool objectives in a timely manner and/or engage in a collaborative effort.

PART 5: ASSESSMENT CYCLE PLAN (Copy and paste from original plan if unchanged)

Cycle Years:	**Plan Description:**
AY2014/18	With each successive year of the first three years of the plan, assessment of SLOs 1, 2, and 3 will be introduced, respectively, and continued throughout the entire five year cycle leading to five years of data on SLO 1, four years on SLO 2, and three years on SLO 3. Beginning year four of the cycle (AY2017/18), SLOs 4 and 5 will both be assessed for each of the two remaining years of the five year cycle. SLO 5 will also optionally be assessed during year five (AY2018/19) within CSCI 1153. SLO 6 will only be assessed during year five (AY2018/19) within CSCI 1153. While SLOs 1, 2, and 3 are each solely assessed in their associated calculus I, II, and III courses, SLOs 4 and 5 are represented in all of the assessed courses and will be assessed concurrently across courses and/or cycled as deemed appropriate.

Student Learning Outcomes*/Exit Competencies:	**When Measured:**	**Where Measured:**	**How Measured:**
1. Demonstrate competency in the core concepts of single-variable, differential calculus which includes limits, continuity, differentiation, and optimization.	AY2014/15 – AY2018/19	MATH 1710	Standard Test Questions: internal and direct.
2. Demonstrate competency in the core concepts of single-variable integral calculus which includes various integration techniques, separable differential equations, and series.	AY2015/16 – AY2018/19	MATH 1715	Standard Test Questions: internal and direct.

3. Demonstrate competency in the core concepts of multivariable and vector calculus which includes level curves and surfaces, partial derivatives, gradients, tangent planes, directional derivatives, multiple integrals, and cylindrical and spherical coordinates	AY2016/17 – AY2018/19	MATH 2710	Standard Test Questions: internal and direct.
4. Construct mathematical strategies using calculus techniques to solve applied problems from a variety of disciplines utilizing appropriate terminology and symbols.	AY 2017/18 AY 2018/19	MATH 1710, 1715, 2710	Standard Test Questions: internal and direct, OR group project/collaborative assessment tool: internal and direct.
5. Develop proficiency in using various technological tools including graphing calculators and mathematical programming software (MATLAB).	AY 2017/18 AY 2018/19	MATH 1710, 1715, 2710, CSCI 1153	Standard Test Questions: internal and direct, OR group project/collaborative assessment tool: internal and direct.
6. Develop proficiency in introductory computer programming skills.	AY 2018/19	CSCI 1153	Standard Test Questions: internal and direct.

* These are the six Program-Level SLO's of the Math Degree.