

Course Assessment Report  
Washtenaw Community College

Discipline	Course Number	Title
Mathematics	192	MTH 192 05/31/2023- Calculus II
College	Division	Department
Math, Science and Engineering Tech	Math, Science and Engineering Tech	Math & Engineering Studies
Faculty Preparer		Clifford Taylor
Date of Last Filed Assessment Report		11/04/2021

**I. Review previous assessment reports submitted for this course and provide the following information.**

1. Was this course previously assessed and if so, when?

Yes

Yes, the course was previously assessed in Summer 2021.

2. Briefly describe the results of previous assessment report(s).

Students comfortably passed all outcomes, but data was skewed due to Covid testing irregularities.

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

Beginning of semester handouts were made to review the most difficult topics from Calculus I. These were made available to all Calculus II instructors.

**II. Assessment Results per Student Learning Outcome**

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan
  - Assessment Tool: Outcome-related common departmental exam questions
  - Assessment Date: Winter 2024
  - Course section(s)/other population: All
  - Number students to be assessed: All

- How the assessment will be scored: Departmentally-developed rubric
- Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
- Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021	2023	2022, 2021

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
1112	199

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 25% of students was selected from each section for which I had access to the common final (32 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. One part time instructor was also unaware that they had to keep the finals, so the finals for those sections were lost. This instructor now knows that they need to keep the final exams. Since the first week of classes in Winter 22 was canceled, it was decided not to hold a common final so this semester was not assessed (6 sections).

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored seven problems from the final on a 4-point scale. Each student had their six scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: <u>Yes</u>
91.5% of students (182/199) achieved success for this outcome, with the weakest of the seven problems still being trigonometric substitution (71% success rate for that particular problem). The other six types of integrals had better success rates (mid 80s to high 90s).

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Based on this data, our students are showing strong knowledge of most integration techniques (u-substitution, Integration by Parts, Inverse Trig integrals, Partial Fraction Decomposition) and applications. They are weakest with Trig substitution, but showing improvement.
As in the previous assessment cycles, some of this data must be taken with a grain of salt as not all sections assessed gave proctored finals. These types of problems are notoriously easy to cheat with widely available computer algebra systems. I expect that when mandatory face-to-face proctoring is established for all class modalities, we may see the success rates on these problems take a dip.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

As is always the case, students could use more help with Trigonometric substitution (a notoriously tricky topic). I suspect that a change in online homework delivery could help improve this topic.
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## Outcome 2: Evaluate limits of functions and sequences.

- Assessment Plan
  - Assessment Tool: Outcome-related common departmental exam questions
  - Assessment Date: Winter 2024
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric

- Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
- Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021	2023	2022, 2021

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
1112	199

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 25% of students was selected from each section for which I had access to the common final (32 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. One part time instructor was also unaware that they had to keep the finals, so the finals for those sections were lost. This instructor now knows that they need to keep the final exams. Since the first week of classes in Winter 22 was canceled, it was decided not to hold a common final so this semester was not assessed (6 sections).

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored three problems from the final on a 2-point scale. Each student had their three scores averaged to obtain an "outcome" score.  
If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this

learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: <u>Yes</u>
78.4% of students (156/199) achieved success for this outcome.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students were adequately prepared to compute limits that arose in the context of sequence and series problems, and in finding the interval of convergence for a power series.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

By continuing to review important limit concepts from Calculus I at the beginning of the semester, I believe we can continue to see high success rates for this topic.

Outcome 3: Determine the convergence or divergence of an infinite series using an appropriate test for convergence.

- Assessment Plan
  - Assessment Tool: Outcome-related common departmental exam questions
  - Assessment Date: Winter 2024
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
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3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 25% of students was selected from each section for which I had access to the common final (32 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. One part time instructor was also unaware that they had to keep the finals, so the finals for those sections were lost. This instructor now knows that they need to keep the final exams. Since the first week of classes in Winter 22 was canceled, it was decided not to hold a common final so this semester was not assessed (6 sections).

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes  
74.4% of students (148/199) achieved success on this outcome.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students continue to show moderate success with this traditionally difficult topic. They seem to be more comfortable with the Ratio Test, but less comfortable with the more involved Comparison Test, which is not surprising.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

This is a topic that is very difficult to practice with the current online homework system (WebAssign). I suspect that a change in online homework delivery (MyOpenMath) coupled with more intentionally-designed problems could help improve the success rates on this topic.

Outcome 4: Derive the Taylor Series for a given function, including the interval of convergence.

- Assessment Plan
  - Assessment Tool: Outcome-related common departmental exam questions
  - Assessment Date: Winter 2024
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021	2023	2022, 2021

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
1112	199

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 25% of students was selected from each section for which I had access to the common final (32 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I

would only have access to the student's final answer and not their work. One part time instructor was also unaware that they had to keep the finals, so the finals for those sections were lost. This instructor now knows that they need to keep the final exams. Since the first week of classes in Winter 22 was canceled, it was decided not to hold a common final so this semester was not assessed (6 sections).

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score.  
If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

76.4% of students (152/199) achieved success on this outcome. Again this has reverted to the historical mean after the "bump" in the previous assessment cycle.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students continue to show decent mastery of these topics from the previous assessment cycle. Pre-Covid, this was one of the failed outcomes, so it will be interesting to see how this success rate changes when mandatory face-to-face proctoring is established for all class modalities. It has been difficult to arrange mandatory proctored testing for the DL and Virtual sections for the past several semesters.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

We have high success rates for this outcome, and I believe that a change in online homework delivery can push them higher.

Outcome 5: Solve a variety of differentiation and integration problems in parametric and polar form.

- Assessment Plan
  - Assessment Tool: Outcome-related common departmental exam questions
  - Assessment Date: Winter 2024
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2022, 2021	2023	2022, 2021

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
1112	199

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 25% of students was selected from each section for which I had access to the common final (32 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. One part time instructor was also unaware that they had to keep the finals, so the finals for those sections were lost. This instructor now knows that they need to keep the final exams. Since the first week of classes in Winter 22 was canceled, it was decided not to hold a common final so this semester was not assessed (6 sections).

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score.  
If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

70.9% of students (141/199) achieved success on this outcome, narrowly passing the standard of success. The parametric problem had a high average score, as usual, at 83.2%, but the polar area problem had a lower average score (69.9%). This is a surprising result, as both of these topics have historically been strong points for students in previous assessment cycles.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

As usual, the parametric topics show a very high success rate, but somewhat surprisingly, students have taken a dip in their success rates for polar area. This may be due to the fact that the finals are a bit too long, and some students cannot finish the last problem on the test.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

A change in homework system with more thoughtfully designed practice problems may remedy this dip in student scores. I will also look into trimming the final exam to make sure that students have enough time to attempt all of the problems.

### III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

As it was in the previous assessment cycle, it is difficult to gauge whether the success on 4 of the 5 outcomes is due to changes made, or due to the fact that many DL and Virtual sections are unable to appropriately proctor their finals. Students have shown much appreciation for the extra review materials, so I do suspect that they are having some impact.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Calculus II is a notoriously difficult course in the calculus sequence, but I believe that we are meeting our students' needs overall. I was surprised that the score on outcome 5 was so close to not passing.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Our department discusses the results from all assessments during the first meeting at the start of the Fall semester.

4. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
Course Assignments	Currently, the standard homework delivery tool is the online homework system WebAssign. This is a very expensive option for students and the quality of available questions varies greatly from section to section. Over this summer, I plan to code up homework sections in the open source and free-to-students online homework system	First, because it is already available, students can get started on the homework immediately and will not get kicked off due to any financial aid issues. This can prevent students from falling behind in a very fast-paced and intense class.  Second, by coding the problems myself, I can make sure to give students	2023

	called MyOpenMath.	more practice on the tricky topics that have historically been difficult in previous assessment cycles. I can also tailor the homework to closer align to the lecture material and hopefully improve students' outcomes and experience with the homework.	
Other: Assessment population	<p>We will be assessing a random sample of 25% of students from now on.</p> <p>We will be working to ensure that all sections of the course are included in future assessment reports.</p>	<p>It's too laborious to assess all students in this case, and 25% will still provide a very large and statistically valid sample.</p> <p>We were able to improve on the initial version of the report by adding more sections. However, we will be proactively communicating with faculty, and leveraging available software, to work toward including all sections in the next report.</p>	2024

5. Is there anything that you would like to mention that was not already captured?

N/A

**III. Attached Files**

[Sample Questions \(W23 Final\)](#)  
[MTH 192 assessment data](#)

**Faculty/Preparer:**

Clifford Taylor

**Date:** 05/31/2023

**Department Chair:** Nichole Klemmer **Date:** 06/07/2023  
**Dean:** Tracy Schwab **Date:** 06/08/2023  
**Assessment Committee Chair:** Jessica Hale **Date:** 04/04/2024

**Course Assessment Report  
Washtenaw Community College**

Discipline	Course Number	Title
Mathematics	192	MTH 192 05/20/2021- Calculus II
College	Division	Department
	Math, Science and Engineering Tech	Math & Engineering Studies
Faculty Preparer		Clifford Taylor
Date of Last Filed Assessment Report		09/12/2019

**I. Review previous assessment reports submitted for this course and provide the following information.**

1. Was this course previously assessed and if so, when?

Yes  August 2019
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2. Briefly describe the results of previous assessment report(s).

Students were successful on all outcomes except SLO 4 (Derive a Taylor series and compute an interval of convergence). Trigonometric substitution integrals and series convergence/divergence were also areas of weakness.
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3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

Extra worksheets for trigonometric substitution and other problem areas were created for Fall 2019. These were made available to anyone teaching Calculus II as optional extra practice for students.
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**II. Assessment Results per Student Learning Outcome**

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Winter 2022
  - Course section(s)/other population: All

- Number students to be assessed: All
- How the assessment will be scored: Departmentally-developed rubric
- Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
- Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020, 2019	2021	2020, 2019

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
885	162

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 40% of students was selected from each section for which I had access to the common final (20 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. I also did not hear back from several instructors during non-Covid semesters and was unable to assess their sections.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored six problems from the final on a 4-point scale. Each student had their six scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this

learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

87.7% of students (142/162) achieved success for this outcome, with the weakest of the 6 problems still being trigonometric substitution (79% success rate for that particular problem). The other 5 types of integrals had very high success rates.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Based on this data, our students are showing strong knowledge of u-substitution, integration by parts, and partial fraction decomposition. They are also mostly successful on the volumes of revolution problems.

Of course, any result in this assessment cycle must be taken with a grain of salt. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students have shown improvement with trigonometric substitution, but it is difficult to say how much of that is due to the change in testing style brought about by Covid.

I have recorded all of my lecture videos and plan to make these available to all faculty and students in Calculus II. I have received a lot of good feedback from students in my virtual classes but I think these will continue to be a beneficial resource when many of the sections return to face-to-face lectures.

Outcome 2: Evaluate limits of functions and sequences.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Winter 2022
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric

- Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
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A random sample of 40% of students was selected from each section for which I had access to the common final (20 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. I also did not hear back from several instructors during non-Covid semesters and was unable to assess their sections.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored three problems from the final on a 4-point scale. Each student had their three scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

One problem was a designated limit problem (with 3 separate limits to compute) while the other 2 were sub-problems (single limits) in a larger problem.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this

learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

78.4% of students (127/162) achieved success on this outcome. The lowest scoring problem was 3.1 (the designated limit problem with 3 parts) with students averaging 79.0% on that problem. This has been a relatively successful outcome in the past and continues to be such.

Of course, any result in this assessment cycle must be taken with a grain of salt. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students were adequately prepared to compute limits that arose in the context of sequence and series problems, and in finding the interval of convergence for power series.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I have recorded all of my lecture videos and plan to make these available to all faculty and students in Calculus II. I have received a lot of good feedback from students in my virtual classes but I think these will continue to be a beneficial resource when many of the sections return to face-to-face lectures.

I plan to create a separate video dedicated specifically to limits, since most of this topic is review from Calculus I.

Outcome 3: Determine the convergence or divergence of an infinite series using an appropriate test for convergence.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Winter 2022
  - Course section(s)/other population: All
  - Number students to be assessed: All
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A random sample of 40% of students was selected from each section for which I had access to the common final (20 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. I also did not hear back from several instructors during non-Covid semesters and was unable to assess their sections.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

84.6% of students (137/162) achieved success on this outcome, which is a surprising result as this is usually a tricky topic for students.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students showed drastic improvement in this outcome compared to previous assessment cycles. Students seemed much more comfortable with the comparison tests and the root and ratio tests.

Of course, any result in this assessment cycle must be taken with a grain of salt. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I have recorded all of my lecture videos and plan to make these available to all faculty and students in Calculus II. I have received a lot of good feedback from students in my virtual classes but I think these will continue to be a beneficial resource when many of the sections return to face-to-face lectures.

Outcome 4: Derive the Taylor Series for a given function, including the interval of convergence.

- Assessment Plan
    - Assessment Tool: Common departmental exam
    - Assessment Date: Winter 2022
    - Course section(s)/other population: All
    - Number students to be assessed: All
    - How the assessment will be scored: Departmentally-developed rubric
    - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
    - Who will score and analyze the data: A subcommittee of the Math 192 instructors
1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020, 2019	2021	2020, 2019

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
885	162

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 40% of students was selected from each section for which I had access to the common final (20 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. I also did not hear back from several instructors during non-Covid semesters and was unable to assess their sections.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

79% of students (128/162) achieved success on this outcome. The average score on the first problem (Taylor series) was an 86% and the average score on the second problem (interval of convergence) was a 76%. There seems to be steady improvement on these types of problems from the previous assessment cycle.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students showed strength both in computing a Taylor series and in finding the interval of convergence of a power series. We seem to have remedied the difficulty we were having with this topic in the previous assessment cycle.

Of course, any result in this assessment cycle must be taken with a grain of salt. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I have recorded all of my lecture videos and plan to make these available to all faculty and students in Calc. II. I have received a lot of good feedback from students in my virtual classes but I think these will continue to be a beneficial resource when many of the sections return to face-to-face lectures.

Outcome 5: Solve a variety of differentiation and integration problems in parametric and polar form.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Winter 2022
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2020, 2019	2021	2020, 2019

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
885	162

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of 40% of students was selected from each section for which I had access to the common final (20 sections out of 42). Some sections during Covid semesters gave finals through WebAssign and had to be discarded since I would only have access to the student's final answer and not their work. I also did not hear back from several instructors during non-Covid semesters and was unable to assess their sections.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including face-to-face, virtual, and DL sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

83.3% of students (135/162) achieved success on this outcome with the average scores being 81.9% on the parametric question and 84.7% on the polar question. This has typically been a strong topic for students in previous assessment cycles.

Of course, any result in this assessment cycle must be taken with a grain of salt. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students have historically had strong success with both parametric and polar topics and continued this trend into this assessment cycle. I suspect that is because these topics are taught immediately before the final exam.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I have recorded all of my lecture videos and plan to make these available to all faculty and students in Calculus II. I have received a lot of good feedback from students in my virtual classes but I think these will continue to be a beneficial resource when many of the sections return to face-to-face lectures.

### III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

It is difficult to say with certainty whether the changes made after the previous assessment were responsible for the rise in success rates this cycle. Many instructors moved to an open book open note "take-home" style for exams during Covid semesters (W20 - W21). I suspect numbers may dip when we return to a face-to-face, proctored testing environment. However, I know that many instructors have developed additional resources for students during these past few semesters which will hopefully allow us to continue this successful streak going forward.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Calculus II is a notoriously difficult course in the calculus sequence, but I believe that we are meeting our students needs overall.

I did expect our success rates to rise over the past few semesters, so that was not much of a surprise. I only hope we can maintain these numbers in the future.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Our department discusses the results from all assessments during the first meeting at the start of the Fall semester.

4.

Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
1st Day Handout	Continue to create more handouts/worksheets to review important topics from Calculus I.	I have made many handouts since the previous assessment cycle and most have been met with enthusiasm from the students. After reviewing some important Calculus I topics, I have definitely seen a rise in student competence and comfort. I plan to continue making more of these worksheets for future semesters, and these are always made available to any instructor teaching Calculus II.	2021
Other: Create new video	Create a separate video dedicated specifically to limits.	Most of this topic is a review from Calculus I	2022

5. Is there anything that you would like to mention that was not already captured?

N/A
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### III. Attached Files

[MTH 192 Assessment SS19 to W21](#)

**Faculty/Preparer:** Clifford Taylor **Date:** 08/02/2021

**Department Chair:** Lawrence David **Date:** 08/04/2021

**Dean:** Victor Vega **Date:** 08/10/2021

**Assessment Committee Chair:** Shawn Deron **Date:** 11/03/2021

Course Assessment Report  
Washtenaw Community College

Discipline	Course Number	Title
Mathematics	192	MTH 192 01/09/2019- Calculus II
Division	Department	Faculty Preparer
Math, Science and Engineering Tech	Math & Engineering Studies	Clifford Taylor
Date of Last Filed Assessment Report		

**I. Review previous assessment reports submitted for this course and provide the following information.**

1. Was this course previously assessed and if so, when?

Yes  July 2017
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2. Briefly describe the results of previous assessment report(s).

Students met the standard of success for all outcomes.
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3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

No changes were intended/made.
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**II. Assessment Results per Student Learning Outcome**

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions

- Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored six problems from the final on a 4-point scale. Each student had their six scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Considering the individual questions, students had an average score greater than or equal to 70% on five out of the six problems. Students averaged close to 90% on u-substitution (a Calculus I review topic) and a solid of revolution integral. The trigonometric substitution problem had the lowest average score of 66.1%. This is traditionally a very difficult topic for Calculus II students.

Overall, our students seem to be quite capable handling various applied integration problems, with trigonometric substitution needing more time and focus.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students achieved solid success on finding volume of solids of revolutions and computing integrals with u-substitution, integration by parts, and partial fraction decomposition.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Although we did achieve success on this outcome, students are still struggling with trigonometric substitution integrals. I have found that WebAssign (the default online homework system for the course) does not have nearly enough good problems to assign for this topic. I have written up a worksheet with many extra practice problems that I will distribute to any interested instructors.

#### Outcome 2: Evaluate limits of functions and sequences.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored three problems from the final on a 2-point scale. Each student had their three scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

This particular topic of computing limits was tricky to assess as each scored problem was really a sub-problem in a larger process. For future semesters, in order to avoid a messy overlap of two outcomes, I will rewrite the common final to include problems that explicitly deal with a stand-alone limit computation.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The students were successful on each individual problem and on the outcome as a whole. The lowest average on any of the three individual problems was a 78.7%. Overall, our students seem to be well prepared to handle the type of limits that show up when dealing with sequences/series.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students were adequately prepared to compute limits that arose in the context of sequence and series problems, and in finding the interval of convergence for power series. As I mentioned earlier in the report, I would like to include a few

stand-alone limit calculation problems in future assessments to further probe their limit taking abilities.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I plan to write up a limit review worksheet to be given at the beginning of the semester. Most students are fairly competent with more advanced limit computing techniques, like L'Hopital's rule, but many forget some of the earlier techniques which are still used frequently in Calculus II.

It may also be beneficial to put together a limit review homework in WebAssign, which could also be assigned early in the semester.

Outcome 3: Determine the convergence or divergence of an infinite series using an appropriate test for convergence.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The students achieved success on this outcome, but barely. The students did particularly well on a problem involving either the Ratio test or Alternating Series test, achieving an average score of 87.4%.

Less successful was a comparison test problem, which had an average score of 68.6%. These types of tests are typically more difficult for students and need more assigned homework and potentially more time in lecture.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students do quite well with the Root/Ratio test.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

We are barely achieving success with this outcome, so improvement will likely be needed to maintain this status. This is traditionally a very difficult topic for

students in Calculus II due to their unfamiliarity with sequences/series, which are not discussed in Calculus I.

I would suggest implementing group assignments after all the series tests have been learned, but before they take the corresponding exam. Individually, the series tests are not too difficult to implement, but keeping them all categorized and sorted takes some practice.

Outcome 4: Derive the Taylor Series for a given function, including the interval of convergence.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No

When it came to individual questions, the average scores were 73% and 76%. Unfortunately, the percentage of students scoring over 70% was only 66.3%, so we did not achieve success on this outcome. This means that we had a great deal of students clustered just below 70% with a decent portion of students scoring perfectly, which pulled the averages over 70% for each problem.

Digging a little further into the sections, I noticed that the scores were steadily improving on this topic as we traversed the semesters from Winter 2018 to Winter 2019. I suspect that instructors have already begun altering their approach to this topic and that it will be a successful outcome in future assessments. It may be the case that the question used on the Winter 2018 was a little tougher than normal and caught many students off-guard.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

On average, students have been improving their performance on these problems as the semesters progress.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

As I mentioned earlier in the report, students are already showing improvement over the semesters that I have assessed. I suspect instructors have already spotted the problem in Winter 2018 and have implemented steps to correct it. If instructors

replicate what they did in Fall 2018 and Winter 2019, I suspect this outcome will be successful when next assessed.

In the meantime, I would suggest assigning more homework problems, and potentially supplementing WebAssign's problems with worksheets.

Outcome 5: Solve a variety of differentiation and integration problems in parametric and polar form.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The first question involving parametric equations had an average score of 84.7% and the second involving polar coordinates had an average score of 74.5%. In terms of the overall outcome, we had 78.2% of students assessed achieve success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are faring well with both parametric and polar equations, with polar being the weaker of the two.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

We are doing well with these topics despite the fact that they occur very late in the semester. Given that there are more pressing problem areas, I would suggest that we focus our limited time and resources for implementing improvements elsewhere.

### III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

No changes were advised in the previous report.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Calculus II is a notoriously difficult course in the calculus sequence, but I believe that we are meeting our students needs overall.

I was not surprised that we are having trouble with trigonometric substitution and series tests, as these are traditionally very difficult topics for students. I was surprised, however, that we had as much trouble as we did with Taylor series. Although these are certainly not easy questions, they are also not what I would consider to be the toughest in the course. As I have mentioned before, I think that this problem is already being addressed and that our scores for this topic will improve in future assessments.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Our department discusses the results from all assessments during the first meeting at the start of the Fall semester.

4. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
1st Day Handout	Create and distribute a review handout/worksheet for limit topics covered in Calculus I. Also suggest that a homework assignment (either paper or through WebAssign) should be assigned at the beginning of the semester.	Being able to comfortably handle limits is a crucial skill to have in Calculus II. If students are made comfortable with limits early in the semester, they can better focus their attention on the new topics learned in this class.	2020
Course Assignments	Increase the number of Taylor series problems in assigned homework.	Students are getting better with these problems, but additional practice is likely needed for them to achieve	2019

		success in the future.	
Course Assignments	Create an additional homework assignment with a good assortment of trigonometric substitution integrals.	WebAssign (the default electronic homework system for this course) does not have a particularly large assortment of these problems to assign for homework. These are tough problems, so students need a larger source of practice problems from which to draw.	2019
Other: Series Test Group Work	Encourage instructors to implement a group assignment where students practice with series tests. In particular, I have found that the "Content Experts" or "Jigsaw" framework works very well for this assignment.	Students need additional time to digest and organize the series tests. Individually, they seem to pick them up and apply them pretty readily, but they struggle with using them as a completed body.	2019

5. Is there anything that you would like to mention that was not already captured?

Regarding the attached assessment data (Excel file):

Each outcome as well as the summary is contained in a separate tab of the Excel file.

### III. Attached Files

[MTH 192 Assessment Data](#)

**Faculty/Preparer:** Clifford Taylor **Date:** 07/24/2019  
**Department Chair:** Lisa Manoukian **Date:** 08/12/2019  
**Dean:** Kimberly Jones **Date:** 08/13/2019

**Assessment Committee Chair:** Shawn Deron **Date:** 09/12/2019  
**Faculty/Preparer:** Clifford Taylor **Date:** 07/24/2019  
**Department Chair:** Lisa Manoukian **Date:** 08/12/2019  
**Dean:** Kimberly Jones **Date:** 08/13/2019  
**Assessment Committee Chair:** Shawn Deron **Date:** 09/12/2019

**Course Assessment Report**  
**Washtenaw Community College**

Discipline	Course Number	Title
Mathematics	192	MTH 192 01/09/2019- Calculus II
Division	Department	Faculty Preparer
Math, Science and Engineering Tech	Mathematics	Clifford Taylor
Date of Last Filed Assessment Report		

**I. Review previous assessment reports submitted for this course and provide the following information.**

1. Was this course previously assessed and if so, when?

Yes  July 2017
----------------------

2. Briefly describe the results of previous assessment report(s).

Students met the standard of success for all outcomes.
--

3. Briefly describe the Action Plan/Intended Changes from the previous report(s), when and how changes were implemented.

No changes were intended/made.
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**II. Assessment Results per Student Learning Outcome**

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019

- Course section(s)/other population: All
- Number students to be assessed: All
- How the assessment will be scored: Departmentally-developed rubric
- Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
- Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored six problems from the final on a 4-point scale. Each student had their six scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Considering the individual questions, students had an average score greater than or equal to 70% on five out of the six problems. Students averaged close to 90% on u-substitution (a Calculus I review topic) and a solid of revolution integral. The trigonometric substitution problem had the lowest average score of 66.1%. This is traditionally a very difficult topic for Calculus II students.

Overall, our students seem to be quite capable handling various applied integration problems, with trigonometric substitution needing more time and focus.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students achieved solid success on finding volume of solids of revolutions and computing integrals with u-substitution, integration by parts, and partial fraction decomposition.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Although we did achieve success on this outcome, students are still struggling with trigonometric substitution integrals. I have found that WebAssign (the default online homework system for the course) does not have nearly enough good problems to assign for this topic. I have written up a worksheet with many extra practice problems that I will distribute to any interested instructors.

Outcome 2: Evaluate limits of functions and sequences.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored three problems from the final on a 2-point scale. Each student had their three scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

This particular topic of computing limits was tricky to assess as each scored problem was really a sub-problem in a larger process. For future semesters, in order to avoid a messy overlap of two outcomes, I will rewrite the common final to include problems that explicitly deal with a stand-alone limit computation.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The students were successful on each individual problem and on the outcome as a whole. The lowest average on any of the three individual problems was a 78.7%.

Overall, our students seem to be well prepared to handle the type of limits that show up when dealing with sequences/series.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students were adequately prepared to compute limits that arose in the context of sequence and series problems, and in finding the interval of convergence for power series. As I mentioned earlier in the report, I would like to include a few stand-alone limit calculation problems in future assessments to further probe their limit taking abilities.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

I plan to write up a limit review worksheet to be given at the beginning of the semester. Most students are fairly competent with more advanced limit computing techniques, like L'Hopital's rule, but many forget some of the earlier techniques which are still used frequently in Calculus II.

It may also be beneficial to put together a limit review homework in WebAssign, which could also be assigned early in the semester.

Outcome 3: Determine the convergence or divergence of an infinite series using an appropriate test for convergence.

- Assessment Plan
    - Assessment Tool: Common departmental exam
    - Assessment Date: Fall 2019
    - Course section(s)/other population: All
    - Number students to be assessed: All
    - How the assessment will be scored: Departmentally-developed rubric
    - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
    - Who will score and analyze the data: A subcommittee of the Math 192 instructors
1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The students achieved success on this outcome, but barely. The students did particularly well on a problem involving either the Ratio test or Alternating Series test, achieving an average score of 87.4%.

Less successful was a comparison test problem, which had an average score of 68.6%. These types of tests are typically more difficult for students and need more assigned homework and potentially more time in lecture.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Our students do quite well with the Root/Ratio test.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

We are barely achieving success with this outcome, so improvement will likely be needed to maintain this status. This is traditionally a very difficult topic for students in Calculus II due to their unfamiliarity with sequences/series, which are not discussed in Calculus I.

I would suggest implementing group assignments after all the series tests have been learned, but before they take the corresponding exam. Individually, the series tests are not too difficult to implement, but keeping them all categorized and sorted takes some practice.

Outcome 4: Derive the Taylor Series for a given function, including the interval of convergence.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: No

When it came to individual questions, the average scores were 73% and 76%. Unfortunately, the percentage of students scoring over 70% was only 66.3%, so we did not achieve success on this outcome. This means that we had a great deal of students clustered just below 70% with a decent portion of students scoring perfectly, which pulled the averages over 70% for each problem.

Digging a little further into the sections, I noticed that the scores were steadily improving on this topic as we traversed the semesters from Winter 2018 to Winter 2019. I suspect that instructors have already begun altering their approach to this topic and that it will be a successful outcome in future assessments. It may be the case that the question used on the Winter 2018 was a little tougher than normal and caught many students off-guard.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

On average, students have been improving their performance on these problems as the semesters progress.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

As I mentioned earlier in the report, students are already showing improvement over the semesters that I have assessed. I suspect instructors have already spotted the problem in Winter 2018 and have implemented steps to correct it. If instructors replicate what they did in Fall 2018 and Winter 2019, I suspect this outcome will be successful when next assessed.

In the meantime, I would suggest assigning more homework problems, and potentially supplementing WebAssign's problems with worksheets.

Outcome 5: Solve a variety of differentiation and integration problems in parametric and polar form.

- Assessment Plan
  - Assessment Tool: Common departmental exam
  - Assessment Date: Fall 2019
  - Course section(s)/other population: All
  - Number students to be assessed: All
  - How the assessment will be scored: Departmentally-developed rubric
  - Standard of success to be used for this assessment: 70% of students who take the final assessment will score at least 70% on the common exam questions
  - Who will score and analyze the data: A subcommittee of the Math 192 instructors

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
2018	2019, 2018	2018

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
647	101

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

A random sample of approximately 40% of 12 sections (out of 26) was taken. I reached out to the instructors of the remaining 14 sections but was unable to obtain their finals.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

All course modalities are represented, including two online sections.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

I scored two problems from the final on a 4-point scale. Each student had their two scores averaged to obtain an "outcome" score. If the student had an outcome score of 70% or higher, they were designated as a success for that outcome.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

The first question involving parametric equations had an average score of 84.7% and the second involving polar coordinates had an average score of 74.5%. In terms of the overall outcome, we had 78.2% of students assessed achieve success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are faring well with both parametric and polar equations, with polar being the weaker of the two.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

We are doing well with these topics despite the fact that they occur very late in the semester. Given that there are more pressing problem areas, I would suggest that we focus our limited time and resources for implementing improvements elsewhere.

### III. Course Summary and Intended Changes Based on Assessment Results

1. Based on the previous report's Intended Change(s) identified in Section I above, please discuss how effective the changes were in improving student learning.

No changes were advised in the previous report.

2. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

Calculus II is a notoriously difficult course in the calculus sequence, but I believe that we are meeting our students needs overall.

I was not surprised that we are having trouble with trigonometric substitution and series tests, as these are traditionally very difficult topics for students. I was surprised, however, that we had as much trouble as we did with Taylor series. Although these are certainly not easy questions, they are also not what I would consider to be the toughest in the course. As I have mentioned before, I think that this problem is already being addressed and that our scores for this topic will improve in future assessments.

3. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

Our department discusses the results from all assessments during the first meeting at the start of the Fall semester.

4. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
1st Day Handout	Create and distribute a review handout/worksheet for limit topics covered in Calculus I. Also suggest that a homework assignment (either paper or through WebAssign) should be assigned at the	Being able to comfortably handle limits is a crucial skill to have in Calculus II. If students are made comfortable with limits early in the semester, they can better focus their attention on the new	2020

	beginning of the semester.	topics learned in this class.	
Course Assignments	Increase the number of Taylor series problems in assigned homework.	Students are getting better with these problems, but additional practice is likely needed for them to achieve success in the future.	2019
Course Assignments	Create an additional homework assignment with a good assortment of trigonometric substitution integrals.	WebAssign (the default electronic homework system for this course) does not have a particularly large assortment of these problems to assign for homework. These are tough problems, so students need a larger source of practice problems from which to draw.	2019
Other: Series Test Group Work	Encourage instructors to implement a group assignment where students practice with series tests. In particular, I have found that the "Content Experts" or "Jigsaw" framework works very well for this assignment.	Students need additional time to digest and organize the series tests. Individually, they seem to pick them up and apply them pretty readily, but they struggle with using them as a completed body.	2019

5. Is there anything that you would like to mention that was not already captured?

Regarding the attached assessment data (Excel file):

Each outcome as well as the summary is contained in a separate tab of the Excel file.

### III. Attached Files

#### [MTH 192 Assessment Data](#)

**Faculty/Preparer:** Clifford Taylor **Date:** 07/24/2019  
**Department Chair:** Lisa Manoukian **Date:** 08/12/2019  
**Dean:** Kimberly Jones **Date:** 08/13/2019  
**Assessment Committee Chair:** Shawn Deron **Date:** 09/12/2019

**Course Assessment Report**  
**Washtenaw Community College**

Discipline	Course Number	Title
Mathematics	192	MTH 192 07/26/2017- Calculus II
Division	Department	Faculty Preparer
Math, Science and Engineering Tech	Mathematics	Frank Gerlitz
Date of Last Filed Assessment Report		

**I. Assessment Results per Student Learning Outcome**

Outcome 1: Solve a variety of integration problems including their applications.

- Assessment Plan
  - Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.
  - Assessment Date: Winter
  - Course section(s)/other population:
  - Number students to be assessed:
  - How the assessment will be scored:
  - Standard of success to be used for this assessment:
  - Who will score and analyze the data:

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
153	74

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

We used a random sample of 70% of all students in all sections who completed the exam.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

A random sample of 74 for each question with no more than 15 from any section and at least one from each section. Of the 6 sections offered, five (5) were face-to-face and one (1) was DL.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Outcome #1 was assessed using 4 questions from the exam. The questions were evaluated individually using a scale of 0 - 4. A sample average was calculated for each question and then an overall average for all four questions was calculated

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Students scored an overall average of 75.9%. This exceeds the standard of success.

When looking at the individual questions, students scored an average of 70% or higher on three of the four questions. The average for question #4 was 62.3%. The highest average was for question #2, with a score of 88%.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

In general, students performed better on integration by parts.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students scored least using trigonometric substitution.

Outcome 2: Determine the convergence or divergence of an infinite series including the applications of a power series.

- Assessment Plan

- Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.
- Assessment Date: Winter
- Course section(s)/other population:
- Number students to be assessed:
- How the assessment will be scored:
- Standard of success to be used for this assessment:
- Who will score and analyze the data:

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
153	74

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

We used a random sample of 70% of all students in all sections who completed the exam.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

A random sample of 74 for each question with no more than 15 from any section and at least one from each section. Of the 6 sections offered, five (5) were face-to-face and one (1) was DL.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Outcome #2 was assessed using 1 question from the exam. The question was evaluated using a scale of 0 - 4. A sample average/overall average was calculated.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this

learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: <u>Yes</u>
Students scored an average of 87.2%. This exceeds the standard of success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students do very well on convergence and divergence. Student scored the highest on this outcome.
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8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students do very well on this outcome.
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Outcome 3: Solve a variety of limit problems including indeterminate forms, improper integrals, sequences and series.

- Assessment Plan
  - Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.
  - Assessment Date: Winter
  - Course section(s)/other population:
  - Number students to be assessed:
  - How the assessment will be scored:
  - Standard of success to be used for this assessment:
  - Who will score and analyze the data:

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
153	74

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

We used a random sample of 70% of all students in all sections who completed the exam.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

A random sample of 74 for each question with no more than 15 from any section and at least one from each section. Of the 6 sections offered, five (5) were face-to-face and one (1) was DL.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Outcome #3 was assessed using 1 question from the exam. The question was evaluated using a scale of 0 - 4. A sample /overall average was calculated for the question.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Students did fairly well on this outcome, exceeding the standard of success with a score of 73.97%.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Students are able to calculate limits. They were able to solve the problem, even though this area is not a strength.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students have difficulty with the concept of limits. The limit theory is used to prove that the mathematics is correct. Having to find the limit of a function is not normally required in classes outside of math.

Outcome 4: Graph and find the derivative and integral of parametric and polar equations.

- Assessment Plan
  - Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.
  - Assessment Date: Winter
  - Course section(s)/other population:
  - Number students to be assessed:
  - How the assessment will be scored:
  - Standard of success to be used for this assessment:
  - Who will score and analyze the data:

1. Indicate the Semester(s) and year(s) assessment data were collected for this report.

Fall (indicate years below)	Winter (indicate years below)	SP/SU (indicate years below)
	2017	

2. Provide assessment sample size data in the table below.

# of students enrolled	# of students assessed
153	74

3. If the number of students assessed differs from the number of students enrolled, please explain why all enrolled students were not assessed, e.g. absence, withdrawal, or did not complete activity.

We used a random sample of 70% of all students in all sections who completed the exam.

4. Describe how students from all populations (day students on campus, DL, MM, evening, extension center sites, etc.) were included in the assessment based on your selection criteria.

A random sample of 74 for each question with no more than 15 from any section and at least one from each section. Of the 6 sections offered, five (5) were face-to-face and one (1) was DL.

5. Describe the process used to assess this outcome. Include a brief description of this tool and how it was scored.

Outcome #4 was scored using one exam question. The question was evaluated using a scale of 0 - 4. An Average was calculated and used to determine if students met the standard of success.

6. Briefly describe assessment results based on data collected for this outcome and tool during the course assessment. Discuss the extent to which students achieved this learning outcome and indicate whether the standard of success was met for this outcome and tool.

Met Standard of Success: Yes

Students scored an average of 76.4%. This exceeds the standard of success.

7. Based on your interpretation of the assessment results, describe the areas of strength in student achievement of this learning outcome.

Finding the derivative and integral were areas of strength.

8. Based on your analysis of student performance, discuss the areas in which student achievement of this learning outcome could be improved. If student met standard of success, you may wish to identify your plans for continuous improvement.

Students could improve on graphing of the function. This has been a shortcoming for classes over time. The department continues to review instruction in this area to find ways to improve students' success.

## II. Course Summary and Action Plans Based on Assessment Results

1. Describe your overall impression of how this course is meeting the needs of students. Did the assessment process bring to light anything about student achievement of learning outcomes that surprised you?

The assessment was effective in measuring student achievement of learning outcomes for calculus 2. The assessment results this time were better than the last time. Students improved on the use of infinite series. This was something that we discovered during our last assessment. The department has been working to improve student learning in this area and it appears we have been successful.

2. Describe when and how this information, including the action plan, was or will be shared with Departmental Faculty.

A report will be made to math faculty during inservice.

3. Intended Change(s)

Intended Change	Description of the change	Rationale	Implementation Date
No changes intended.			

4. Is there anything that you would like to mention that was not already captured?

<p>73.8 % successfully earned credit for the course.</p> <p>78.4 % successfully completed the random assessment.</p>
--

### III. Attached Files

[Grading Rubric for Calculus 2 assessment](#)  
[MTH 192 data](#)

**Faculty/Preparer:** Frank Gerlitz **Date:** 08/21/2017  
**Department Chair:** Lisa Rombes **Date:** 08/21/2017  
**Dean:** Kristin Good **Date:** 08/24/2017  
**Assessment Committee Chair:** Michelle Garey **Date:** 02/26/2018

**COURSE ASSESSMENT REPORT**

**I. Background Information**

1. Course assessed:  
 Course Discipline Code and Number: MTH 192  
 Course Title: Calculus II  
 Division/Department Codes: MNBS/MTH
2. Semester assessment was conducted (check one):  
 Fall 2010  
 Winter 20\_\_  
 Spring/Summer 20\_\_
3. Assessment tool(s) used: check all that apply.  
 Portfolio  
 Standardized test  
 Other external certification/licensure exam (specify):  
 Survey  
 Prompt  
 Departmental exam  
 Capstone experience (specify):  
 Other (specify):
4. Have these tools been used before?  
 Yes  
 No

If yes, have the tools been altered since its last administration? If so, briefly describe changes made.  
 YES, QUESTIONS WERE ALTERED

5. Indicate the number of students assessed/total number of students enrolled in the course.  
 78 STUDENTS ASSESSED/97 STUDENTS ENROLLED
6. Describe how students were selected for the assessment.  
 A RANDOM SAMPLE OF 16 FOR EACH QUESTION WITH NO MORE THAN 5 FROM ANY SECTION AND AT LEAST ONE FROM EACH SECTION.

**II. Results**

1. Briefly describe the changes that were implemented in the course as a result of the previous assessment.  
 NONE
2. List each outcome that was assessed for this report exactly as it is stated on the course master syllabus.
  - 1 SOLVE A VARIETY OF INTEGRATION PROBLEMS INCLUDING THEIR APPLICATIONS
  - 2 DETERMINE THE CONVERGENCE OR DIVERGENCE OF AN INFINITE SERIES INCLUDING APPLICATIONS OF A POWER SERIES.
  - 3 SOLVE A VARIETY OF LIMIT PROBLEMS INCLUDING INDETERMINATE FORMS, IMPROPER INTEGRALS, SEQUENCES AND SERIES.
  - 4 GRAPH AND FIND THE DERIVATIVE AND INTEGRAL OF PARAMETRIC AND POLAR EQUATIONS
3. Briefly describe assessment results based on data collected during the course assessment, demonstrating the extent to which students are achieving each of the learning outcomes listed above. *Please attach a summary of the data collected.*  
 81 % OF THE STUDENTS SUCCESSFULLY COMPLETED THE CLASS.  
 81.25 % OF THE STUDENTS SUCCESSFULLY COMPLETED THE RANDOM ASSESSMENT.
4. For each outcome assessed, indicate the standard of success used, and the percentage of students who achieved that level of success. *Please attach the rubric/scoring guide used for the assessment.*

**COURSE ASSESSMENT REPORT**

THE TEST QUESTIONS WERE SCORED ON A SCALE OF 0 – 4.  
 85 % OF THE STUDENTS ASSESSED MET OUTCOME #1 (Fair understanding or better)  
 71 % OF THE STUDENTS ASSESSED MET OUTCOME #2 & #3 (Fair understanding or better)  
 86% OF THE STUDENTS ASSESSED MET OUTCOME #4 (Fair understanding or better)

5. Describe the areas of strength and weakness in students' achievement of the learning outcomes shown in assessment results.

Strengths: OUTCOMES #1 AND #4

Note: Most missed integration problem was a u-substitution from Calculus 1? (Question #6)

Weaknesses: OUTCOMES #2 & #3

Note: Only 38% of the students assessed were able to approximate the solution to an integral using a series (Question #14).

**III. Changes influenced by assessment results**

1. If weaknesses were found (see above) or students did not meet expectations, describe the action that will be taken to address these weaknesses.

RECOMMEND TO ALL CALCULUS <sup>II</sup> TWO INSTRUCTORS THAT MORE TIME BE ALLOTTED TO THE APPROXIMATION OF AN INTEGRAL USING A SERIES.

2. Identify intended changes that will be instituted based on results of this assessment activity (check all that apply). Please describe changes and give rationale for change.

a.  Outcomes/Assessments on the Master Syllabus

Change/rationale:

b.  Objectives/Evaluation on the Master Syllabus

Change/rationale:

c.  Course pre-requisites on the Master Syllabus

Change/rationale:

d.  1<sup>st</sup> Day Handouts

Change/rationale:

e.  Course assignments

Change/rationale:

f.  Course materials (check all that apply)

Textbook

Handouts

Other:

g.  Instructional methods

Change/rationale:

h.  Individual lessons & activities

Change/rationale:

RECOMMEND TO ALL CALCULUS <sup>II</sup> TWO INSTRUCTORS THAT MORE TIME BE ALLOTTED TO THE APPROXIMATION OF AN INTEGRAL USING A SERIES.

3. What is the timeline for implementing these actions?

WINTER 2011

**IV. Future plans**

1. Describe the extent to which the assessment tools used were effective in measuring student achievement of learning outcomes for this course.

Please return completed form to the Office of Curriculum & Assessment, SC 247.

COURSE ASSESSMENT REPORT

THE ASSESSMENT WAS EFFECTIVE IN MEASURING STUDENT ACHIEVEMENT OF LEARNING OUTCOMES FOR CALCULUS II

- 2. If the assessment tools were not effective, describe the changes that will be made for future assessments.
- 3. Which outcomes from the master syllabus have been addressed in this report?

All  Selected

If "All", provide the report date for the next full review: FALL 2013

If "Selected", provide the report date for remaining outcomes: \_\_\_\_\_

Submitted by:

Print: Frank Gerlitz Signature: [Signature] Date: 3/5/2011  
Faculty/Preparer

Print: Justin Chatas Signature: [Signature] Date: 3/7/11  
Department Chair

Print: M. Shawn Signature: \_\_\_\_\_ Date: MAR 14 2011  
Dean/Administrator