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

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.

II. Assessment Results per Student Learning Outcome

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan

    o Assessment Tool: Common departmental exam

    o Assessment Date: Fall 2019

    o Course section(s)/other population: All

    o Number students to be assessed: All

    o How the assessment will be scored: Departmentally-developed rubric

    o 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

- o 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-subsititution (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

    o Assessment Tool: Common departmental exam

    o Assessment Date: Fall 2019

    o Course section(s)/other population: All

    o Number students to be assessed: All

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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

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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

    o Assessment Tool: Common departmental exam

    o Assessment Date: Fall 2019

    o Course section(s)/other population: All

    o Number students to be assessed: All

    o How the assessment will be scored: Departmentally-developed rubric

    o 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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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

    o   Assessment Tool: Common departmental exam

    o   Assessment Date: Fall 2019

    o   Course section(s)/other population: All

    o   Number students to be assessed: All

    o   How the assessment will be scored: Departmentally-developed rubric

    o   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

    o   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
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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 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

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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.

II. Assessment Results per Student Learning Outcome

Outcome 1: Solve a variety of applied integration problems.

- Assessment Plan

   o   Assessment Tool: Common departmental exam

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Met Standard of Success: <u>Yes</u>
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Outcome 2: Evaluate limits of functions and sequences.

- Assessment Plan

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  - Assessment Date: Fall 2019

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> 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

  o Assessment Tool: Common departmental exam

  o Assessment Date: Fall 2019

  o Course section(s)/other population: All

  o Number students to be assessed: All

  o How the assessment will be scored: Departmentally-developed rubric

  o 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

  o 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: <u>Yes</u>
>
> 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

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

    o Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.

    o Assessment Date: Winter

    o Course section(s)/other population:

    o Number students to be assessed:

    o How the assessment will be scored:

    o Standard of success to be used for this assessment:

    o 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: <u>Yes</u>
>
> 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

- o Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.

- o Assessment Date: Winter

- o Course section(s)/other population:

- o Number students to be assessed:

- o How the assessment will be scored:

- o Standard of success to be used for this assessment:

- o 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.

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.

Outcome 3: Solve a variety of limit problems including indeterminant forms, improper integrals, sequences and series.

- Assessment Plan

    o Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.

    o Assessment Date: Winter

    o Course section(s)/other population:

    o Number students to be assessed:

    o How the assessment will be scored:

    o Standard of success to be used for this assessment:

    o 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

    o Assessment Tool: Common departmental exam questions administered to students in all sections, written report and analysis of results.

    o Assessment Date: Winter

    o Course section(s)/other population:

    o Number students to be assessed:

    o How the assessment will be scored:

    o Standard of success to be used for this assessment:

    o 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?

> 73.8 % successfully earned credit for the course.
>
> 78.4 % successfully completed the random assessment.

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/\   Y

5. Indicate the number of students assessed/total number of students enrolled in the course.
    78 STUDENTS ASSESSED/97 STUDENTS ENROLLED \   Y.

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/\   X
    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 SERIVATIVE AND INTEGRAL OF PARAMETRIC AND POLAR   X
        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.*

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 ASSEDED MET OUTCOME #2 & #3 (Fair understanding or better)
86% OF THE STUDENTS ASSEDED MET OUTCOME #4 (Fair understanding or better)
assessed

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 TWO INSTRUCTORS THAT MORE TIME BE ALLOTED 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. ☐ 1ˢᵗ 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 TWO INSTRUCTORS THAT MORE TIME BE
          ALLOTED 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.   **2 of 3**
Approved by the Assessment Committee 11/08

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 __X__   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** _____   **Date:** 3/5/2011
Faculty/Preparer

Print: Kristin Chatas   **Signature** _____   **Date:** 3/7/11
Department Chair

Print: M. Brown   **Signature** _____   **Date:** MAR 1 4 2011
Dean/Administrator

logged 3/17/11 sfr
Approved by the Assessment Committee 11//08