

Application: 0000000555

Daniel McLaughlin - dmclaughlin@navajotech.edu
NM General Education Curriculum

Summary

ID: 0000000555

Status: Approved

Last submitted: Jun 10 2019 01:17 PM (MDT)



Application Form

Completed - Jun 10 2019

Application Form

The goal of the new models of General Education is to create an intentional curriculum that develops the essential skills that college graduates need to be successful. The New Mexico Curriculum & Articulation Committee will evaluate each certification form to understand how the course introduces, reinforces, and assesses the three essential skills. New Mexico's new General Education models must be adopted by all of New Mexico's public higher education institutions by **August 1, 2019**.

Essential Skills

The defining characteristic of the New Mexico General Education Curriculum Model is its focus on essential skills. Three essential skills are associated with each of six content areas:

1. Communications: Communication, Critical Thinking, Information & Digital Literacy
2. Mathematics: Communication, Critical Thinking, Quantitative Reasoning
3. Science: Critical Thinking, Personal & Social Responsibility, Quantitative Reasoning
4. Social & Behavioral Sciences: Communication, Critical Thinking, Personal & Social Responsibility
5. Humanities: Critical Thinking, Information & Digital Literacy, Personal & Social Responsibility
6. Creative and Fine Arts: Communication, Critical Thinking, Personal & Social Responsibility
7. Other: 3 Essential Skills chosen by the institution

Faculty teaching courses within any given content area must weave the three related essential skills throughout their course while also addressing content knowledge and skills.

Deadline for Next Curriculum Committee Meeting

Applications to add courses to the new General Education Curriculum must be received by **May 17, 2019** to be heard at the **June 13-14, 2019** NMCAC Meeting.

****Applications approved at the April meeting will be archived on May 17, 2019.****

Tips for Completing the General Education Course Application

- When pasting into the application from another document, paste your text without formatting.
- In the narratives, avoid qualifiers (frequently, often, given the opportunity) when discussing what students do throughout the course.
- The assessment that is uploaded should be an example of what is discussed in the narrative.
- Narratives should describe what activities students **do** to develop the essential skills throughout the course.

Contact Information

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Title	Student Learning Coordinator
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Submitting Institution

Name of HEI	Navajo Technical University
Submitting Department	Math, Engineering, & Technology

Chief Academic Officer

Name	Casmir Agbaraji
Email	cagbaraji@navajotech.edu

Registrar

Name	Natathli Becenti
Email	n.becenti@navajotech.edu

Is this application for your entire system (ENMU, NMSU, & UNM)?

Yes

Institutional Course Information

Prefix	MTH
Number	163
Title	Calculus II
Number of credits	4

Was this course previously part of the New Mexico General Education curriculum?

Yes

Will this course only count toward General Education for the AAS degree (at your institution)?

No

Co-requisite Course

Prefix	(No response)
Number	(No response)
Title (if applicable)	(No response)

New Mexico Common Course Information

Prefix	MATH
Number	1520
Name	Calculus II

A. Content Area and Essential Skills

To which area should this course be added?

Indicate "Other" if the course is not associated with one of the six NM General Education areas.

Mathematics - Communication, Critical Thinking, Quantitative Reasoning

B. Learning Outcomes

List all common course student learning outcomes for the course.

Common Course Student Learning Outcomes (find Common Course SLOs at:
<http://www.hed.state.nm.us/programs/request-a-change-to-the-nmccns.aspx>)

1. Integration

- a. Determine the indefinite integrals and compute definite integrals of algebraic and transcendental functions using various techniques of integration including integration by parts, trigonometric substitution, and partial fraction decomposition.
- b. Compute improper integrals using the appropriate limit definitions.
- c. Solve problems involving separable differential equations.

2. Sequences and Series

- a. Compute the limit of sequences.
- b. Compute the sum of a basic series using its n th partial sum.
- c. Compute the sum of geometric and telescoping series.
- d. Determine if a series converges using the appropriate test, such as the n th term, integral, p -series, comparison, limit comparison, ratio, root, and alternating series tests.
- e. Determine if a series converges absolutely, converges conditionally or diverges.

3. Properties of power series

- a. Compute the radius and interval of convergence of a power series.
- b. Compute the Taylor polynomials of functions.
- c. Compute basic Taylor series using the definition.
- d. Compute Taylor series using function arithmetic, composition, differentiation, and integration.
- e. Compute limits with Taylor series.
- f. Approximate definite integrals with Taylor series and estimate the error of approximation.
- g. Determine the sum of a convergent series using Taylor series.

4. Applications of integration

- a. Compute volumes and areas of surfaces of solids of revolution.
- b. Compute length of curves.
- c. Apply integration using alternative coordinate forms and using a parameter.

Institution-specific Student Learning Outcomes

List all institution-specific Student Learning Outcomes that are common to all course sections offered at the institutions regardless of instructor.

NA

C. Narrative

In the boxes provided, write a short (~300 words) narrative explaining how the course weaves the essential skills associated with the content area throughout the course. Explain what students are going to do to develop the essential skills and how you will assess their learning. The narrative should be written with a general audience in mind and avoid discipline specific jargon as much as possible.

Be sure to address the component skills listed next to each essential skills. The number of component skills that must be addressed by your narrative is listed.

Communication. Genre and Medium Awareness, Application and Versatility; Strategies for Understanding and Evaluating Messages; and Evaluation and Production of Arguments.

In this box, provide a narrative that explains how the proposed course addresses all of the components of communication.

Group discussion and classroom discussion are used in the Calculus II class. Students work in small groups to analyze and answer given questions and make conclusions. Meanwhile students develop strategies for understanding and interpreting mathematical statements. In small group problem solving, students need to apply their mathematical communication skills to explain their reasoning, defend their understanding, and reach to the final agreement. Each student may come up a different way to solve the same problem from different point of views. For example, to differentiate $y=x^{\cos x}$, some students may apply the chain rule directly, while others may apply properties of $\ln x$: $\ln y = \ln x^{\cos x} = \cos x \ln x$, $y'/y = \cos x/x - \sin x \ln x$. Classroom discussions are used for every class to ask students to explain their work and reasoning. This can be assessed by evaluation and production of an argument. For example, to proof a mathematical statement, students need to apply related knowledge to explain their logical steps and reasoning for each step, and defend their answers.

Critical Thinking. Problem Setting; Evidence Acquisition; Evidence Evaluation; and Reasoning/Conclusion.

In this box, provide a narrative that explains how the proposed course addresses all of the components of critical thinking.

Calculus II covers applications of integration in real world. Students need to interpret problem and represent mathematically. Students need to think differently to solve the problem, involving visualization skills, estimation methods, and creative thinking. For example, calculating arc length requires students to use segment length for estimation. It also covers proof of convergence of a series. A list of convergence theorems are introduced to students in different cases. Students need to think critically to analyze the problem when giving a statement, then apply appropriate theorems to proof, and assemble an argument to evaluate convergence and divergence of the series.

Quantitative Reasoning. Communication/Representation of Quantitative Information; Analysis of Quantitative Arguments; and Application of Quantitative Models

In this box, provide a narrative that explains how the proposed course addresses all of the components of quantitative reasoning.

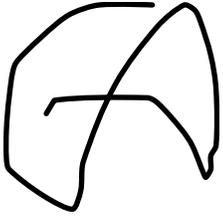
Calculus II develops quantitative reasoning through integration, series, and real world problems. Students are required to switch between variables and quantities. Orally and written explanation of quantitative information is required to start analyze a word problem. With understanding the given information, students will analyze and interpret it mathematically. Then students will use their knowledge to solve the problem to come up with answers. Finally, students need to debate their answers to fit the mathematical models.

D. Assessment Plan (Must be on file with HED by August 1, 2019)

Link to Institution's General Education Assessment Plan

<http://www.navajotech.edu/academics/general-education-resources>

This course has been reviewed by the institution's Chief Academic Officer and meets institutional standards for general education (signature of CAO below).



Date

Jun 10 2019



Upload Assessment

Completed - Jun 10 2019

The assessment should illustrate how at least one of the essential skills is assessed within the context of the course.

MATH1520

Filename: MATH1520.sample.assessment.pdf Size: 397.5 kB



Upload Rubric

Incomplete

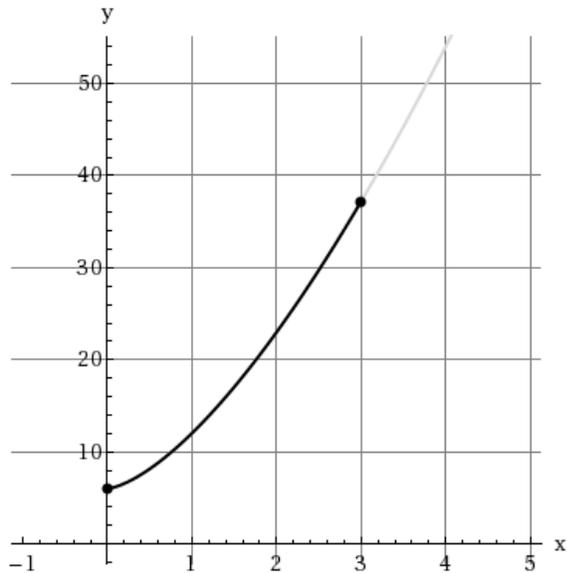
The optional rubric should illustrate how at least one of the essential skills is assessed within the context of the course.

1. Question Details

LarCalc11 7.4.010. [3852738]

Find the arc length of the graph of the function over the indicated interval. (Round your answer to three decimal places.)

$$y = 6x^{3/2} + 6$$



2. Question Details

LarCalc11 7.4.013.MI.SA. [3863422]

This question has several parts that must be completed sequentially. If you skip a part of the question, you will not receive any points for the skipped part, and you will not be able to come back to the skipped part.

Tutorial Exercise

Find the arc length of the graph of the function over the indicated interval.

$$y = \frac{x^5}{10} + \frac{1}{6x^3}, \quad [3, 5]$$

Step 1

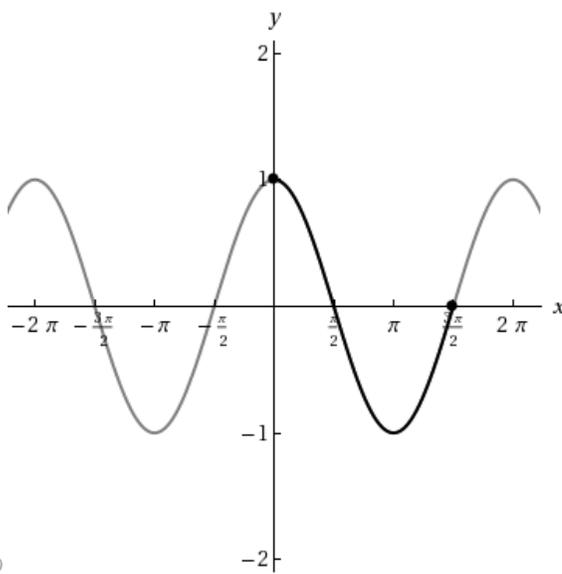
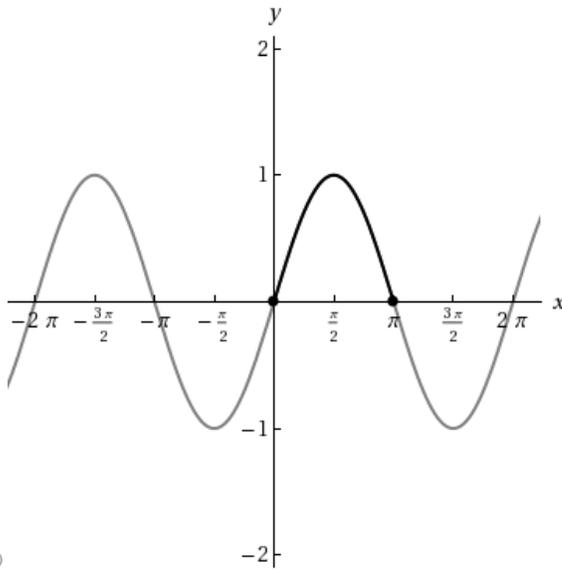
Write the original function $y = x^{\frac{\square}{10}} + \frac{1}{\square x^{\square}}$.

The formula for arc length is $s = \int_a^b \sqrt{1 + (y')^2} dy$.

Consider the following.

$$y = \sin(x), \left[0, \frac{3\pi}{2}\right]$$

- (a) Sketch the graph of the function, highlighting the part indicated by the given interval.

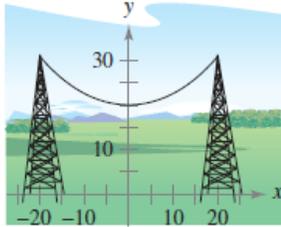


An electric cable is hung between two towers that are 40 meters apart (see figure). The cable takes the shape of a catenary whose equation is as follows, where x and y are measured in meters.

$$y = 10(e^{x/20} + e^{-x/20}), \quad -20 \leq x \leq 20$$

Find the arc length (in m) of the cable between the two towers. (Round your answer to three decimal places.)

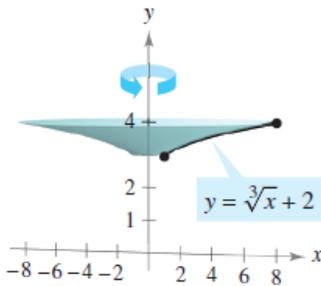
m



Write and evaluate the definite integral that represents the area of the surface generated by revolving the curve on the indicated interval about the y -axis. (Round your answer to two decimal places.)

$$y = \sqrt[3]{x} + 2$$

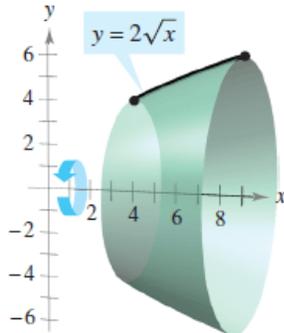
$$2\pi \int_1^{\boxed{}} \boxed{} dx = \boxed{}$$



Write and evaluate the definite integral that represents the area of the surface generated by revolving the curve on the indicated interval about the x -axis. (Round your answer to three decimal places.)

$$y = 2\sqrt{x}$$

$$2\pi \int_4^{\quad} \left(\quad \right) dx = \quad$$



Write the definite integral for finding the indicated surface area. Then use the integration capabilities of a graphing utility to approximate the surface area.

An ornamental light bulb is designed by revolving the graph of the equation shown below about the x -axis, where x and y are measured in feet (see figure).

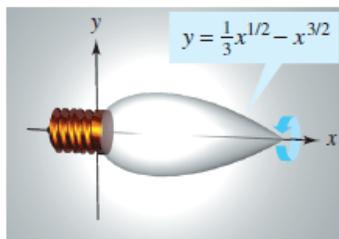
$$y = \frac{1}{3}x^{1/2} - x^{3/2}, \quad 0 \leq x \leq \frac{1}{3}$$

Write the definite integral for finding the surface area (in ft^2) of the bulb and approximate. (Round your answer to four decimal places.)

$$2\pi \int_0^{\quad} \left(\quad \right) dx = \quad \text{ft}^2$$

Use the result to approximate the amount of glass needed to make the bulb (in ft^3). (Assume that the glass is 0.015 inch thick. Round your answer to five decimal places.)

$$V = \quad \text{ft}^3$$



Determine the convergence or divergence of the sequence with the given n th term. If the sequence converges, find its limit. (If the quantity diverges, enter DIVERGES.)

$$a_n = \frac{(4n)!}{(4n-1)!}$$

Use the Direct Comparison Test or the Limit Comparison Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3 + 2n}}$$

- converges
- diverges

Consider the following.

$$\sum_{n=1}^{\infty} n \left(\frac{4}{7}\right)^n$$

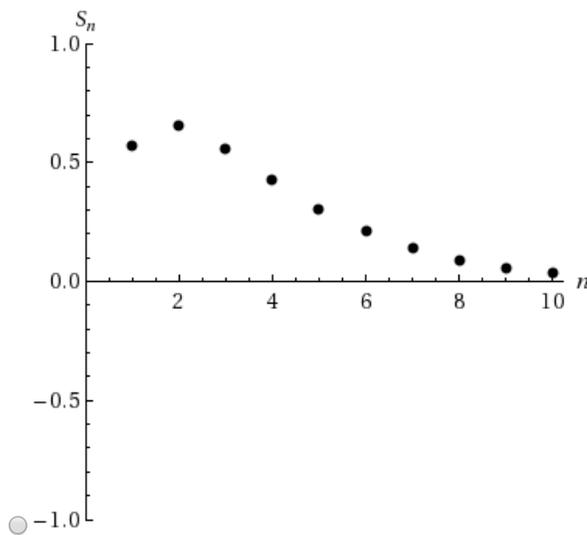
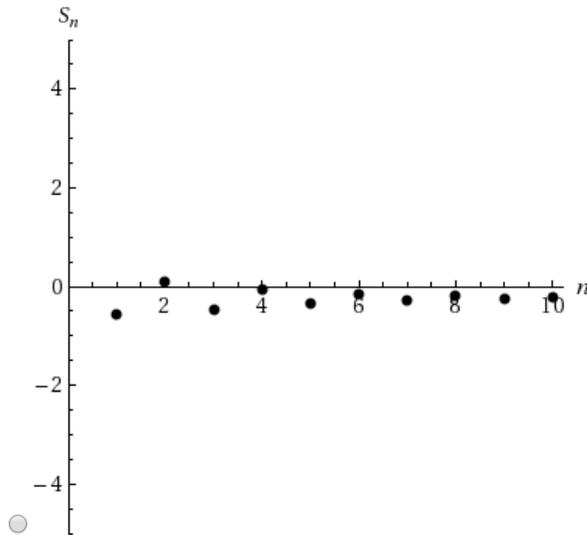
(a) Verify that the series converges.

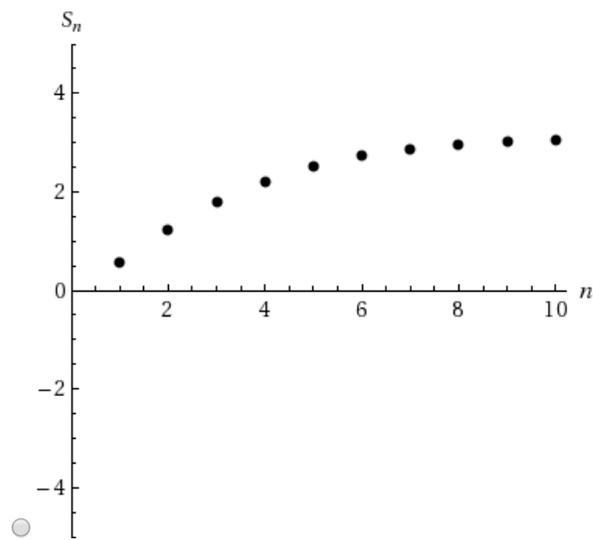
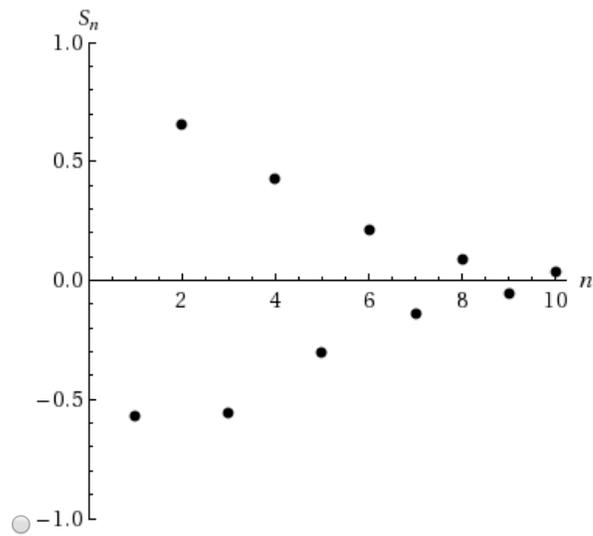
$$\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right| = \text{[input box]} < 1$$

(b) Use a graphing utility to find the indicated partial sum S_n and complete the table. (Round your answers to four decimal places.)

n	5	10	15	20	25
S_n	<input type="text"/>				

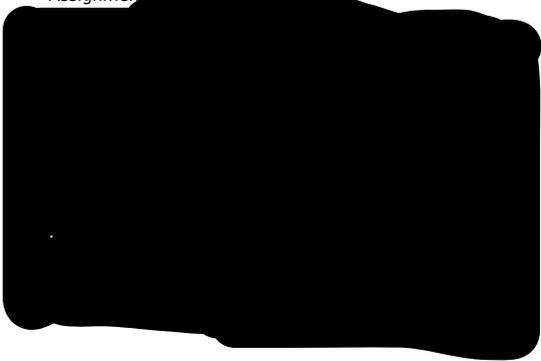
(c) Use a graphing utility to graph the first 10 terms of the sequence of partial sums.





(d) Use the table to estimate the sum of the series. (Round your answer to two decimal places.)

Assignment Details



Feedback Settings

- Before due date
- Question Score
- Assignment Score
- Publish Essay Scores
- Question Part Score
- Mark
- Add Practice Button
- Help/Hints
- Response
- Save Work
- After due date
- Question Score
- Assignment Score
- Publish Essay Scores
- Key
- Question Part Score
- Solution

Mark
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Response