Course Title – Calculus

Implement start year – 2015-2016

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Unit # 5, topic – Applications of Integration

Transfer Goal –

Students will be able to independently use their learning to apply the rules for finding integrals that they've learned to solve applied problems.

Stage 1 – Desired Results

Established Goals	21st Century Themes (www.21stcenturyskills.org)
2009 NJCCC Standard(s), Strand(s)/CPI # (http://www.nj.gov/education/cccs/2009/final.htm) **Common Core Curriculum Standards for Math and English** (http://www.corestandards.org/) Since the Calculus curriculum goes beyond the Common Core Curriculum Standards for Math, the NCTM standards have been adopted: • Analyze change in various contexts. • Represent and analyze mathematical situations using algebraic symbols. • Use mathematical models to represent and understand quantitative relationships. • Apply and adapt a variety of appropriate strategies to solve problems. • Apply appropriate techniques, tools, and formulas to determine measurements. • Use the language of mathematics to express mathematical ideas precisely. • Understand how mathematical ideas interconnect and build on one another.	_x_ Global Awareness _x_Financial, Economic, Business and Entrepreneurial Literacy __Civic Literacy _x_Health Literacy _x_Environmental Literacy **21st Century Skills** *Learning and Innovation Skills:* _x_Creativity and Innovation _x_Critical Thinking and Problem Solving _x_Communication and Collaboration *Information, Media and Technology Skills:* _x_Information Literacy _x_Media Literacy _x_ICT (Information, Communications and Technology) Literacy *Life and Career Skills:* _x_Flexibility and Adaptability _x_Initiative and Self-Direction _x_Social and Cross-Cultural Skills _x_Productivity and Accountability _x_Leadership and Responsibility

Enduring Understandings:	Essential Questions:
Students will understand that . . .	
EU 1	*EU 1*
techniques of calculus can be used to describe real-life phenomena.	• How do techniques of calculus describe real-life phenomena?
	EU 2
EU 2	• How can the application of definite integrals be extended to find area under a curve to finding the area of a region bounded by two curves?
areas and volumes of irregular shapes and solids can be determined using calculus techniques.	• How can the definite integral be used to find the volume of a three-dimensional solid?
Knowledge:	**Skills:**
Students will know . . .	*Students will be able to . . .*
EU 1	*EU 1*
• functions which model growth and decay can be solved using methods of integration.	• use exponential functions to model growth and decay.
• differential equations, when written implicitly, can be solved by separation of variables.	• use separation of variables to solve simple differential equations.
• differential equations can be used to model real-life problems.	• recognize and solve differential equations which can be solved by separation of variables.
	• use differential equations to solve real-world problems.
EU 2	*EU 2*
• integration techniques are used to find the area between two curves.	• find the area between two curves.
• integration techniques can be used to find the volume of a solid of revolution.	• find the volume of a solid of revolution using the disk or washer methods

Stage 2 – Assessment Evidence

Performance Task #1:

Other Recommended Evidence: *Tests, Quizzes, Prompts, Self-assessment, Observations, Dialogues, etc.*

- Quiz on Differential Equations: Growth and Decay
- Quiz on Separation of Variables
- Quiz on Area of a Region Between Two Curves
- Quiz on Volume: The Disk Method and Known Cross Section
- Unit Test
- Assessed elements from the recommended performance tasks

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections:

- Activity #1: Area Between Curves (A)

What is the area of the following symbol?

Procedures:
1. Enlarge and superimpose the above symbol onto grid paper.
2. Study the symbol carefully to decide:
   a) how many functions will be needed to represent the shape
   b) the domains for each function
3. Select a sufficient number of points for each function and enter into the TI-Nspire.
4. Find an equation for each part of the symbol.
5. Using your knowledge of Calculus, find the area of the symbol.

- Activity #2: Solids of Revolution-Disc (A, M)
  http://education.ti.com/en/timathnspired/us/detail?id=3A57A5D19E3A4EB3B33CC3AFB9E7912C&t=2596C50B247541C1B54AC803ECC87BD1

- Activity #3: Visualizing Solids of Revolution-Washers (A, M)
  http://education.ti.com/en/timathnspired/us/detail?id=06B156C0931E40C1813C0C550ADDC486&t=2596C50B247541C1B54AC803ECC87BD1

The following is a suggested sequence of learning activities for the Accelerated Calculus class. Approximate days for completion: 25.

- YWBAT use separation of variables to solve a simple differential equation.
- YWBAT use exponential functions to model growth and decay in applied problems.
- YWBAT recognize and solve differential equations that can be solved by separation of variables.
- YWBAT find the area of a region between two curves using integration.
    - Activity #1
- YWBAT find the area of a region between to intersecting curves using integration
- YWBAT find the volume of a solid of revolution using the disk/washer methods.
    - Activity #2, #3
- YWBAT find the volume of a solid with known cross section.
- Performance Task

Critical Vocabulary:
- Differential Equation
- Growth/Decay
- Initial Value
- Proportionality Constant
- Separable
- Representative Rectangle
- Bounded
- Disk
- Washer
- Revolution
- Outer Radius
- Inner Radius
- Cross Section