Winslow Township School District

Calculus AB

Unit 4 – Integration Applications and Differential Equations

Overview: In this unit, students will find the Area between the graphs of two functions by partitioning the x-axis or the y-axis. Students will use the disk and washer method by revolving objects around the x and y axis to find the Volume of the solid. Students will apply approximation techniques including the Trapezoidal and Simpson's Rules. Students will identify model Differential Equations including population growth and the motion of a spring. Students will understand differential equations using graphs. Students will use Euler's method and Approximation. Students will solve Differential Equations that are separable.

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Unit 4 – Integration Applications and Differential Equations

Overview	Standards	Unit Focus	Essential Questions
Unit 4 **Anti-Differentiation** **And** **Applications**	APC.11 APC.12 APC.13 APC.14 APC.15	• The student will find antiderivatives directly from derivatives of basic functions and by substitution of variables. • The student will identify the properties of the definite integral. • The student will use the Fundamental Theorem of Calculus to evaluate definite integrals • The student will find specific antiderivatives, using initial conditions (including applications to motion along a line). • The student will use integration techniques and appropriate integrals to model physical, biological, and economic situations.	• How can integrals be used to find areas of complex figures? • How are the practical applications of finding such areas described? • What is an improper integral and under what circumstances do they arise? • How can integrals be used to find volumes of complex figures? • How are the practical applications of finding such volumes explored? • How is a differential equation defined in calculus? • How can one use differential equations to model real world problems?
Unit 4: Enduring Understandings	Find the Area between the graphs of two functions by partitioning the x-axis or the y-axis. Use the disk and washer method by revolving objects around the x and y axis to find the Volume of the solid. Apply approximation techniques including the Trapezoidal and Simpson's Rules. Identify model Differential Equations including population growth and the motion of a spring. Understand differential equations using graphs. Use Euler's method and Approximation. Solve Differential Equations that are separable.		

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Curriculum Unit 4	Standards		Pacing	
			Days	Unit Days
Unit 4: **Integration Applications** **And** **Differential Equations**	APC.11	Find antiderivatives directly from derivatives of basic functions and by substitution of variables.	20	45
	APC.12	Identify the properties of the definite integral.		
	APC.13	Use the Fundamental Theorem of Calculus to evaluate definite integrals.	20	
	APC.14	Find specific antiderivatives, using initial conditions (including applications to motion along a line).		
	APC.15	Use integration techniques and appropriate integrals to model physical, biological, and economic situations.		
		Assessment, Re-teach and Extension	5	

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Unit 4 Calculus AB	
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
Pre-Assessment Quizzes, Tests Projects Exit Tickets Daily Monitoring	Unit Benchmark SAT Testing AP Testing
Resources	**Activities**
Textbook: **Sullivan & Miranda, Calculus, 2ⁿᵈ Edition, 2018, BFW Publishing** ➢ TI 84+ ➢ Smartboard Technology ➢ Desmos ➢ https://www.khanacademy.org/math/calculus ➢ **Diversity, Equity & Inclusion Educational Resources** https://www.nj.gov/education/standards/dei/	• Find the Area between the graphs of two functions by partitioning the x-axis or the y-axis. • Use the disk and washer method by revolving objects around the x and y axis to find the Volume of the solid. • Apply approximation techniques including the Trapezoidal and Simpson's Rules. • Identify model Differential Equations including population growth and the motion of a spring. • Understand differential equations using graphs. • Use Euler's method and Approximation. • Solve Differential Equations that are separable.

Instructional Best Practices and Exemplars	
1. Identifying similarities and differences	6. Cooperative learning
2. Summarizing and note taking	7. Setting objectives and providing feedback
3. Reinforcing effort and providing recognition	8. Generating and testing hypotheses
4. Homework and practice	9. Cues, questions, and advance organizers
5. Nonlinguistic representations	10. Manage response rates

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training, 9.3 21st Century Life and Careers & 9.4 Life Literacies and Key Skills

9.3.ST.2: Use technology to acquire, manipulate, analyze and report data.
9.3.ST-ET.5: Apply the knowledge learned in STEM to solve problems.
9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.

Additional opportunities to address 9.1, 9.2 & 9.4:
Philadelphia Mint
https://www.usmint.gov/learn/kids/resources/educational-standards
Different ways to teach Financial Literacy.
https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/

Modifications for Special Education/504

Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignment. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all   students as teaching strategies are considered.

- Small group instruction and demonstration

- Electronic, printed and verbal instruction

- One-on-one demonstration

- Leveled informational texts and videos via online

- Modeling and guided practice

- Read directions aloud

- Repeat, rephrase and clarify directions

- Extended time as needed

- Break down assignments into smaller units

- Provide shortened assignments

- Modify testing format

- Preferential seating

- Graphic organizers

- Study guides, study aids and re-teaching as needed

Modifications for At-Risk Students

Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time will be made available with a certified instructor to aid students in reaching the standards.

- Contact parents, guidance & child study if students are in danger of failing.

- Provide an assignment sheet with step-by-step instructions as well as specifications for each project.

- Provide design templates.

- Provide study guides.

- Provide extended time for written assessments.

- Extended time as needed

- Read directions aloud

- Assist with organization

- Use of computer to create, edit and store student work.

- Emphasize/highlight key concepts

- Recognize success

- Provide timelines for work completion

- Break down multi-step tasks into smaller chunks

- Provide copy of class notes and graphic organizer

English Language Learners	Modifications for Gifted Students

All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors
 ☐ Grades 9-12 WIDA Can Do Descriptors:
      ☐ Listening ☐ Speaking ☐ Reading
      ☐ Writing ☐ Oral Language
 Students will be provided with accommodations and modifications that may include:
 • Relate to and identify commonalities in Architectural & Engineering studies in student's home country
 • Use sentence/paragraph frames to assist with writing reports.
 • Work with a partner to develop and understand written and design projects
 • Provide extended time for written responses.
 • Assist with organization
 • Use of computer for quick translation
 • Emphasize/highlight key concepts
 • Teacher Modeling
 • Peer Modeling
 • Label Classroom Materials - Word Walls
	Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.
	 • Raise levels of intellectual demands
	 • Require higher order thinking, communication, and leadership skills
	 • Differentiate content, process, or product according to student's readiness, interests, and/or learning styles
	 • Provide higher level texts
	 • Expand use of open-ended, abstract questions
	 • Critical and creative thinking activities that provide an emphasis on research and in-depth study
	 • Enrichment Activities/Project-Based Learning/ Independent Study
	 Additional Strategies may be located at the links:
	 ❖ Gifted Programming Standards
	 ❖ Webb's Depth of Knowledge Levels and/or Revised Bloom's Taxonomy
	 ❖ REVISED Bloom's Taxonomy Action Verbs

Interdisciplinary Connections
ELA

ELA

NJSLSA.SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

NJSLSA.SL2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

NJSLSA.R7. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

NJSLSA.R10. Read and comprehend complex literary and informational texts independently and proficiently with scaffolding as needed.

NJSLSA.W4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

RI.9-10.1 Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.) and make relevant connections, to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.

RI.9-10.2 Determine a central idea of a text and analyze how it is developed and refined by specific details; provide an objective summary of the text.

W.9-10.6 Use technology, including the Internet, to produce, share, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest.

SL.9-10.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English.

RI.11-12.1 Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.

RI.11-12.2 Determine two or more central ideas of a text, and analyze their development and how they interact to provide a complex analysis; provide an objective summary of the text.

Integration of Computer Science and Design Thinking NJSLS 8

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.

8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.

8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible.

8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.