

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Overview: In this unit, students will be to discover how to find the derivative of a function using the limit definition and understand the relationship between differentiability and continuity. Students will explore how to find the derivative of a function using basic differentiation rules. Students will learn how to find the derivative of a function using the Product and Quotient Rules. Students will learn how to find the derivative using implicit differentiation. Students will be able to independently distinguish between linear and exponential functions of an equation; situation or graph. Students will be able to review the analysis of curves including the notions of monotonicity and concavity. Students will learn the Optimization, both absolute (global) and relative (local) extrema. Students will understand the importance of modeling rates of change, including related rates problems. Students will learn the use of implicit differentiation to find the derivative of an inverse function. Students will understand the interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed and acceleration.

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Overview	Standards	Unit Focus	Essential Questions
<p><u>Unit 2</u></p> <p>Differentiation and Applications of Differentiation</p>	<p>APC.7</p> <p>APC.8</p> <p>APC.9</p> <p>APC.10</p>	<ul style="list-style-type: none"> • Analyzing the derivative of a function • Applications of Derivatives • Formulas to Solve for Derivatives • Algebraic and Graphical Representations 	<ul style="list-style-type: none"> • How can we use derivatives solve problems? • How is IVT theorem defined? • How is differentiating implicitly important in the concept of Calculus? • How do you differentiate sum, product and quotient of functions? • How can a function be transformed prior to differentiation in to apply a simpler differentiation rule? • How can derivatives be applied to solving motion problems? • What information do the first and second derivatives of a function give one about the function itself? • How can differentiation techniques be used in estimation problems? • What information do the first and second derivatives of a function give one about the function itself?
<p><i>Unit 2: Enduring Understandings</i></p>	<p>Students will be to discover how to find the derivative of a function using the limit definition and understand the relationship between differentiability and continuity. Students will explore how to find the derivative of a function using basic differentiation rules. Students will learn how to find the derivative of a function using the Product and Quotient Rules. Students will learn how to find the derivative using implicit differentiation. Students will be able to independently distinguish between linear and exponential functions of an equation; situation or graph. Students will be able to review the analysis of curves including the notions of monotonicity and concavity. Students will learn the Optimization, both absolute (global) and relative (local) extrema. Students will understand the importance of modeling rates of change, including related rates problems. Students will understand the interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed and acceleration.</p>		

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Curriculum Unit 2	Standards		Pacing	
			Days	Unit Days
Unit 2: Differentiation and Applications of Differentiation	APC.7	The student will analyze the derivative of a function as a function in itself.	25	45
	APC.8	The student will apply the derivative to solve problems.		
	APC.9	The student will apply formulas to find derivatives	15	
	APC.10	The student will use Riemann sums and the Trapezoidal Rule to approximate definite integrals of functions represented algebraically and graphically.		
	Assessment, Re-teach and Extension		5	

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Unit 2 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
<p>Textbooks:</p> <p>Sullivan & Miranda, <i>Calculus</i>, 2nd Edition, 2018, BFW Publishing</p> <ul style="list-style-type: none"> ➤ TI 84+ ➤ Smartboard Technology ➤ Desmos ➤ https://www.khanacademy.org/math/calculus <p>➤ Diversity, Equity & Inclusion Educational Resources https://www.nj.gov/education/standards/dei/</p>	<ul style="list-style-type: none"> • Students will be to discover how to find the derivative of a function using the limit definition and understand the relationship between differentiability and continuity. • Students will explore how to find the derivative of a function using basic differentiation rules. • Students will learn how to find the derivative of a function using the Product and Quotient Rules. • Students will learn how to find the derivative using implicit differentiation. • Students will be able to independently distinguish between linear and exponential functions of an equation; situation or graph. • Students will be able to review the analysis of curves including the notions of monotonicity and concavity. • Students will learn the Optimization, both absolute (global) and relative (local) extrema. • Students will understand the importance of modeling rates of change, including related rates problems. • Students will understand the interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed and acceleration.

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Instructional Best Practices and Exemplars

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Identifying similarities and differences
2. Summarizing and note taking
3. Reinforcing effort and providing recognition
4. Homework and practice
5. Nonlinguistic representations | 6. Cooperative learning
7. Setting objectives and providing feedback
8. Generating and testing hypotheses
9. Cues, questions, and advance organizers
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/>

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

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

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

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

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

English Language Learners	Modifications for Gifted Students
<p>All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors</p> <p><input type="checkbox"/> Grades 9-12 WIDA Can Do Descriptors:</p> <ul style="list-style-type: none"><input type="checkbox"/> Listening <input type="checkbox"/> Speaking <input type="checkbox"/> Reading<input type="checkbox"/> Writing <input type="checkbox"/> Oral Language <p>Students will be provided with accommodations and modifications that may include:</p> <ul style="list-style-type: none">• 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	<p>Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.</p> <ul style="list-style-type: none">• 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 <p>Additional Strategies may be located at the links:</p> <ul style="list-style-type: none">❖ Gifted Programming Standards❖ Webb’s Depth of Knowledge Levels and/or Revised Bloom’s Taxonomy❖ REVISED Bloom’s Taxonomy Action Verbs

Winslow Township School District

Calculus AB

Unit 2 – Differentiation and Applications of Differentiation

Interdisciplinary Connections

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.