

Hamilton Heights School Corporation AP Calculus AB Curriculum Map

Course Title: AP Calculus AB	Quarter 1:	Academic Year: 2025-26
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Essential Questions -Can change occur at an instant? -How does knowing the value of a limit, or that one does not exist, help you make sense of interesting features of functions and graphs? -Why do mathematical properties and rules for simplifying and evaluating limits apply to differentiation? -How is the average rate of change related to instantaneous rate of change? -How are derivatives related to continuity and the tangent line on a curve? -How do the derivative rules relate to each other? -How do the rates of change relate to real life situations? -How are equations of tangent lines related to linearization problems?						
Unit Name	Total Days	Standards Number	Knowledge Objectives	Skills Objectives	Specific Assessments	Specific Resources
Limits and Continuity	23	C.LC.1 C.LC.2 C.LC.3 C.LC.4 C.LC.5 C.LC.6 C.LC.7 C.LC.8 C.LC.9	-Introducing Calculus -Define limits and use limit notation -Estimate limits values from graphs and tables -Determine limits using algebraic properties and manipulation -Select procedures for	-Discuss the idea of a limit. -Investigate a limit using a table and/or a graph. Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. -Apply appropriate mathematical rules or	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 1 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources

		C.LC.10 C.LC.11 C.LC.12	determining limits including the Squeeze Theorem -Connect multiple representations of limits -Explore types of discontinuities -Define continuity at a point -Confirm continuity on an interval -Remove discontinuities -Connect limits involving infinity and asymptotes -Work with the Intermediate Value Theorem (IVT)	procedures, with and without technology. -Identify an appropriate mathematical rule or procedure based on the classification of a given expression. -Confirm whether hypotheses or conditions of a selected definition, theorem, or test have been satisfied. -Identify a re-expression of mathematical information presented in a given representation. -Identify an appropriate mathematical definition, theorem, or test.		-Topic Questions and Progress Checks
Differentiation: Definition and Fundamental Properties	13	C.D.1 C.D.2 C.D.3 C.D.4 C.D.5 C.D.6 C.D.7 C.D.8	- Define average and instantaneous rates of change at a point - Define the derivative of a function - Use derivative notation - Estimate derivatives of a function at a point	-Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. -Identify an appropriate mathematical rule or procedure based on the relationship between	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 2 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher

		C.D.9 C.D.10 C.D.11	- Connect differentiability and continuity - Apply the power rule - Use derivative rules (constant, sum, difference, and constant multiple) - Find derivatives of $\cos x$, $\sin x$, e^x, and $\ln x$ - Use the Product Rule - Use the Quotient Rule - Find derivatives of tangent, cotangent, secant, and cosecant functions	- concepts or processes to solve problems. -Apply appropriate mathematical rules or procedures, with and without technology. -Provide reasons or rationales for solutions and conclusions.		Resources -Topic Questions and Progress Checks
Differentiation: Composite, Implicit, and Inverse Functions	10	C.D.1 C.D.2 C.D.3 C.D.4 C.D.5 C.D.6 C.D.7 C.D.8 C.D.9 C.D.10 C.D.11	-Use the Chain Rule -Use implicit differentiation -Differentiate inverse functions including inverse trigonometric functions -Select procedures for calculating derivatives -Calculate higher-order derivatives	-Identify an appropriate mathematical rule or procedure based on the classification of a given expression (e.g., Use the chain rule to find the derivative of a composite function). -Apply appropriate mathematical rules or procedures, with and without technology. -Confirm that solutions are accurate and appropriate.	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 3 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources -Topic Questions and Progress Checks

Course Title: AP Calculus AB	Quarter 2:	Academic Year: 2025-26
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Essential Questions -How do the rates of change relate to real life situations? -How are equations of tangent lines related to linearization problems? -How do derivatives relate to properties of a function graph? -How do derivatives help solve optimization problems?						
Unit Name	Total Days	Standards Number	Knowledge Objectives	Skills Objectives	Specific Assessments	Specific Resources
Contextual Applications of Differentiation	11	C.AD.1 C.AD.2 C.AD.3 C.AD.4 C.AD.5 C.AD.6 C.AD.7 C.AD.8 C.AD.9 C.AD.10 C.AD.11 C.AD.12	- Interpret the meaning of derivatives in context - Understand straight-line motion: connect position, velocity, and acceleration - Apply rates of change to contexts other than motion - Solve related rates problems - Approximate values of a function using local linearity and linearization - Use L'Hopital's Rule to determine limits of indeterminate forms	-Identify an appropriate mathematical rule or procedure based on the relationship between concepts (e.g., rate of change and accumulation) or processes (e.g., differentiation and its inverse process, anti-differentiation) to solve problems. -Apply appropriate mathematical rules or procedures, with and without technology. -Identify common underlying structures in problems	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 4 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources -Topic Questions and Progress Checks

				involving contextual situations. -Explain the meaning of mathematical solutions in context. -Explain how an approximated value relates to the actual value. -Apply an appropriate mathematical definition, theorem, or test.		
Analytical Applications of Differentiation	15	C.AD.1 C.AD.2 C.AD.3 C.AD.4 C.AD.5 C.AD.6 C.AD.7 C.AD.8 C.AD.9 C.AD.10 C.AD.11 C.AD.12	-Use the Mean Value Theorem -Use the Extreme Value Theorem -Find global and local extrema using critical points -Determine intervals of increasing and decreasing on a function -Use the First Derivative Test for extrema -Use the Candidates Test for extrema -Determine concavity of functions on their domains -Use the Second Derivative	-Provide reasons or rationales for solutions and conclusions. -Describe the relationships among different representations of functions and their derivatives. -Apply an appropriate mathematical definition, theorem, or test. -Apply appropriate mathematical rules or procedures, with and without technology. -Identify how mathematical characteristics or properties	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 5 Quizzes and Test Semester 1 Exam	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources -Topic Questions and Progress Checks

			Test to determine extrema -Sketch graphs of functions and their derivatives -Connect functions, first and second derivatives -Solve optimization problems -Explore behaviors of implicit relations	of functions are related in different representations. -Identify common underlying structures in problems involving contextual situations. -Explain the meaning of mathematical solutions in context.		
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Course Title: AP Calculus AB	Quarter 3:	Academic Year: 2025-26
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Essential Questions -How do basic shapes in Geometry help us estimate areas in Calculus? -How are properties of definite Integrals related to Riemann Sum definition? -How does the Mean Value Theorem justify conclusion in application problems? -How can integrals be used to find area and volume? -How does Fundamental Theorem of Calculus connect derivatives and integrals? -How do you use the definite integral as an accumulating function (Fundamental Theorem of Calculus part 2)? -In what ways are the transcendental functions supported by calculus? -How do derivatives help with indeterminate limits? -In what ways are differential equations related to real world problems? -How do slope fields relate to differential equations? -What is the difference between displacement and distance and how are integrals written to find each?
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Unit Name	Total Days	Standards Number	Knowledge Objectives	Skills Objectives	Specific Assessments	Specific Resources
Integration and Accumulation of Change	20	C.I.1 C.I.2 C.I.3 C.I.4 C.I.5 C.I.6 C.I.7 C.I.8	- Explore accumulations of change - Approximate areas with Riemann Sums - Connect and apply Riemann Sums, summation notation, and definite integral notation - Work with the Fundamental Theorem of Calculus and accumulation functions - Interpret the behavior of accumulation functions involving area - Apply properties of definite integrals - Work with the Fundamental Theorem of Calculus and definite integrals - Find antiderivatives and indefinite integrals - Integrate using substitution - Integrate functions using long division and completing the square	-Use appropriate units of measure. -Explain how an approximated value relates to the actual value. -Identify a re-expression of mathematical information presented in a given representation. -Identify an appropriate mathematical rule or procedure based on the relationship between concepts or processes to solve problems. -Identify how mathematical characteristics or properties of functions are related in different representations. -Apply an appropriate mathematical definition, theorem, or test. -Use appropriate mathematical symbols and notation.	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions Unit 6 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources -Topic Questions and Progress Checks

				-Apply appropriate mathematical rules or procedures, with and without technology -Identify an appropriate mathematical rule or procedure based on the classification of a given expression (e.g., Use the chain rule to find the derivative of a composite function).		
Differential Equations	9	C.AI.1 C.AI.2 C.AI.3	-Model situations with differential equations -Verify solutions for differential equations -Sketch and reason with slope fields -Find general solutions using separation of variables -Find particular solutions using initial conditions and separation of variables -Use differential equations with exponential models	-Identify a re-expression of mathematical information presented in a given representation. -Confirm that solutions are accurate and appropriate. -Use appropriate graphing techniques. -Apply appropriate mathematical rules or procedures, with and without technology.	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions - Unit 7 Quizzes and Test	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources -Topic Questions and Progress Checks

Course Title: AP Calculus AB	Quarter 4:	Academic Year: 2025-26
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Essential Questions

- How do basic shapes in Geometry help us estimate areas in Calculus?
- How are properties of definite Integrals related to Riemann Sum definition?
- How does the Mean Value Theorem justify conclusion in application problems?
- How can integrals be used to find area and volume?
- How does Fundamental Theorem of Calculus connect derivatives and integrals?
- How do you use the definite integral as an accumulating function (Fundamental Theorem of Calculus part 2)?
- In what ways are the transcendental functions supported by calculus?
- How do derivatives help with indeterminate limits?
- In what ways are differential equations related to real world problems?
- How do slope fields relate to differential equations?
- What is the difference between displacement and distance and how are integrals written to find each?

Unit Name	Total Days	Standards Number	Knowledge Objectives	Skills Objectives	Specific Assessments	Specific Resources
Applications of Integration	20	C.AI.4 C.AI.5 C.AI.6 C.AI.7	- Find the average value of a function on an interval - Connect position, velocity, and acceleration using integrals - Use accumulation functions and definite integrals in applied contexts - Find the area between	-Apply appropriate mathematical rules or procedures, with and without technology. -Identify an appropriate mathematical rule or procedure based on the relationship between concepts or processes to	AP Classroom (online): –Topic Questions –Progress Check: Multiple Choice Questions –Progress Check: Free Response Questions - Unit 8 Quizzes and Test - Semester 2 Exam - Practice AP exams	Textbook: Larson <u>Calculus of a Single Variable</u> (9th edition) Larson Textbook website and CalChat.com AP Classroom (online): –Daily Videos -Student and Teacher Resources

			curves expressed as functions of x - Find the area between curves expressed as functions of y - Find the area between curves that intersect at more than two points - Calculate volumes with cross sections - Calculate volumes with the Disc Method - Calculate volume with the washer method	solve problems. -Apply an appropriate mathematical definition, theorem, or test. - Use appropriate mathematical symbols and notation. -Identify mathematical information from graphical, numerical, analytical, and/or verbal representations. -		-Topic Questions and Progress Checks
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