

**Lawrence Public Schools
Mathematics Curriculum Map, 2014-2015
AP Calculus AB**

Limits and Derivatives

August/September

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-1 Make sense of problems and persevere in solving them (tinkering, trying ideas and refining guesses) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Limits and Derivatives</p> <ul style="list-style-type: none"> ● What is a limit? ● What is a derivative? ● What role do derivatives and limits play as a foundation for the calculus and in practical applications? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Apply the definition of the derivative ● Use limit theorems to find limits of functions ● Apply the definition of the derivative correctly to find derivatives of functions without resorting to derivative theorems ● Take derivatives of polynomials via the sum and power rules 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Differentiation

October

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-2 Reason abstractly and quantitatively (multiple representation of functions) MP-4 Model with mathematics (functions and function-modeling language) MP-8 Express regularity in repeated reasoning (describe patterns explicitly, explain inconsistencies)</p>	<p>Complex Numbers and Trigonometry</p> <ul style="list-style-type: none"> ● In what types of problems do the various differentiation rules apply? ● 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? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Use the power, quotient, sum, product and chain rules to find the derivatives of composite functions, and use these rules appropriately while differentiating implicitly ● Set up and solve equations in related rates problems 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Functions and Estimation Problems

November

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-3 Construct arguments and critique the reasoning of others (deductive reasoning) MP-7 Look for and make use of structure (operations as transformations) MP-8 Look for and express regularity in repeated reasoning (complex numbers as <i>extension</i> of real numbers)</p>	<p>Functions and Estimation Problems</p> <ul style="list-style-type: none"> ● 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 does calculus give us concerning graphs of functions? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Sketch curves of functions after identifying all asymptotes and intercepts and after using the first and second derivative to identify intervals over which function is increase/decreasing, concave up/down, extrema, and inflection points ● Use the above listed techniques to find antiderivatives for a wide variety of functions ● Compute definite integrals by taking limits of Riemann sums, checking there work with the fundamental theorem of calculus 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Integrals				December
Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-3 Construct viable arguments and critique the reasoning of others (logical reasoning) MP-8 Look for and express regularity in repeated reasoning MP-2 Reason abstractly and quantitatively MP-4 Model with mathematics</p>	<p>Integrals</p> <ul style="list-style-type: none"> ● What is an integral? ● How are integrals related to derivatives? ● What is the relationship between an integral and area ● How can one apply numerical techniques to compute an integral without knowing the associated antiderivative? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Integrate complex trigonometric, polynomial functions ● Set up and solve differential equations that model a variety of phenomena in science, business, and population dynamics ● “Linearize” functions, set up and solve optimization problems, and approximate zeros of functions via Newton's method (on paper and using recursive operations on a graphing calculator) ● Approximate the area under curves by hand and via calculators using all the methods listed above 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Logarithms and e

January

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-3 Construct viable arguments and critique the reasoning of others (logical reasoning, conjectures) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Logarithms and e</p> <ul style="list-style-type: none"> ● What is a logarithm and how can a natural log be defined in terms of an integral? ● What is so special about the number e? ● What is a differential equation? ● How can one use differential equations to model real world problems? ● How does one deal with exponential and logarithmic functions in derivatives and integrals? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Derive various properties of exponential and logarithmic functions ● Integrate complex trigonometric, polynomial, exponential, and logarithmic functions ● Set up and solve differential equations that model a variety of phenomena in science, business, and population dynamics 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Integration and Slope Fields

February

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-1 Make sense of problems and persevere in solving them (tinkering) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Analytic Geometry:</p> <ul style="list-style-type: none"> ● What role do inverse trigonometric and hyperbolic functions play in calculus? ● How can one approximate solutions to differential equations numerically? ● What is a slope field and how can it be used to find solutions to differential equations? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Identify integrals that involve inverse trig, make the appropriate substitutions, integrate, and convert back to the original variable of integration ● Draw slope fields and graphical solutions to differential equation ● Interpret the meaning of an initial condition 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Integrals and Area

March

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-1 Make sense of problems and persevere in solving them (tinkering) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Integrals and Area</p> <ul style="list-style-type: none"> ● How can integrals be used to find areas of complex figures? ● What are the practical applications of finding such areas? ● What is an improper integral and under what circumstances do they arise? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Integrate a wide range of functions, require a broad spectrum of techniques ● Graph two curves, find their intersections, set up an integral for the area between the curves, and compute the area 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Integrals and Volume

April

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-1 Make sense of problems and persevere in solving them (tinkering) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Integrals and Volume</p> <ul style="list-style-type: none"> ● How can integrals be used to find volumes of complex figures? ● What are the practical applications of finding such volumes? ● What is about certain functions that lend themselves naturally to one method but not another? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Students will explain the difference between the disc, washer, and shell methods ● Determine which method is preferred in particular cases and explain why only one method will work in certain cases 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>

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Applying the Tools of Calculus

May/June

Standards	Concepts	Learning Outcomes	Assessment	Resources
<p>MP-1 Make sense of problems and persevere in solving them (tinkering) MP-7 Look for and make use of structure (reducing problems to simpler ones) MP-8 Look for and express regularity in repeated reasoning (generalizing repeated calculations)</p>	<p>Applying the Tools of Calculus</p> <ul style="list-style-type: none"> ● How is calculus useful in science, business, and other fields? ● What is the relationship between derivatives and integrals? 	<p>Students will be able to:</p> <ul style="list-style-type: none"> ● Demonstrate the ability to make use of all the main concepts acquired throughout the school year 	<p>Summative assessments:</p> <ul style="list-style-type: none"> ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) <p>Formative assessments:</p> <ul style="list-style-type: none"> ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question 	<p>Text</p> <p>LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/</p> <p>CME Project website: http://cmeproject.edc.org</p> <p>Pearson Online text and resources: www.pearsonsuccessnet.com</p> <p>Common Core Standards of Mathematical Practice</p> <p>Illustrative Mathematics Project</p> <p>Common Core Standards of Mathematical Practice</p> <p>Problem solving strategy: <i>Noticing and Wondering</i></p> <p>For intervention and remediation: Khan Academy videos and assessments</p>