High School (9-12)

Gateway High School
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Gateway School District
Curriculum Map

Curriculum Map: Mathematics

Course: AP CALC AB
Grade(s):11/12

Unit 1: Limits and Their Properties

Brief Summary of Unit
Students will explore the concept of Limits, including general limits, one sided limits, limits as you approach asymptotes and continuity. These concepts will be used latter to aid in graphing by hand and the development of the derivative.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Limits by tabular method.
2. Limits by graphic method.
3. Limits by substitution method.
4. Limits by factoring then substituting.
5. Limits by using the conjugate then substitution.
6. Changing an absolute value into a piece-wise function before evaluation of limit.
7. Evaluate sigma and delta using the formal definition.

Understandings:	Essential Questions:
1. **Limits can be found by 4 methods.** 1. **Straight Substitution** 2. **Factoring then Sub.** 3. **Tabular Method** 4. **Graphic method** 2. **The meaning of the formal definition of the limit in reference to a graph.**	1. What are the four methods to find limits? 2. How can you apply the formal definition of a limit?

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Unit 2: <mark>Differentiation</mark>

Brief Summary of Unit
Students will learn various derivative techniques, first starting with the Formal Def. of the Derivative and then continuing with the short cut rules; power rule, product rule, quotient rule, chain rule, implicit differentiation and derivatives of Trig. Functions. Students will also apply these to solving physics problems and related rates.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find slopes of lines using the slope equation.
2. Find slopes of curves using the formal def. of derivative.
3. Find slopes of curves using short cuts.
4. Find equations of tangent lines using the formal and short cuts.
5. Find where functions have horizontal slopes.
6. Solve physics problems using the derivative.
7. Find the derivative using implicit differentiation.

Understandings:	**Essential Questions:**
1. The how the formal definition of the derivative works by using a limit to change the secant line into a tangent line. 2. The proofs of some of the short cut rules. 3. How to find the equation of tangent lines by using the derivative and the point-slope formulas. 4. How to use implicit differentiation to find derivatives when you can't solve for y.	**1.** How can you use formal definition of limit to find the tangent line? **2.** How do you find the equation of the tangent line by using derivative? **3.** How do you use implicit differentiation to find a derivative?

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 3: <mark>Application of Differentiation</mark>

Brief Summary of Unit
Students will their ability to differentiate equations to aid them in sketching curves by hand by finding local extrema, inflection points and end behavior. They will apply this knowledge to optimization problems as well as using Newton's method and differentials.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find where a graph is increasing or decreasing
2. Find the max and mins of a graph
3. Find points of inflection on a graph.
4. Find intervals of concavity.
5. Graph complex and rational functions by hand using calculus.
6. Find the optimization of word problems
7. Solve physics problems using the derivative.
8. Find the derivative using implicit differentiation.
9. Use Newtons method and Differentials to approximate zeros.

Understandings:	Essential Questions:
1. **1st Derivative Test for I/D** 2. **1st Der. Test for Max/Min** 3. **2nd Der. Test for Concavity** 4. **2nd Der. Test for Inflections** 5. **Limits as x approaches infinity.** 6. **Newton's Method and Differentials**	**1.** How can the slope determine the optimization of a problem? **2.** How can the derivative be used to determine max/mins and intervals of I/D, concavity and Inflection points.

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 4: Integration

Brief Summary of Unit

Students will learn the basic antiderivative and then develop integration techniques from Riemann Sum's and the Fundamental Theorem of Calculus. They will learn the substitution method and how to find both definite and indefinite integrals. They will also learn how to find areas of unusual shapes in nature by using the Trapezoid and Simpson methods.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Find basic antiderivatives of functions and trig. Functions.
2. Use Ram to find approximate areas under curves.
3. Rewrite Limits of summations in integral form.
4. Evaluate complex summations.
5. Apply the properties of integrals to find more complex integrals
6. Solve physics problems using the antiderivative.
7. Evaluate the mean value and average value using integration.

8. Apply the substitution method to solve complex integrals.	

Understandings:	**Essential Questions:**
1. **Anti-derivative process for basic power rule.** 2. **Left Ram, Right Ram, and Middle Ram.** 3. **Summation rules for ¡, ¡2, ¡3** 4. **Constant Multiple rule.** 5. **Sum rule of integers.** 6. **Domination Rule of integers.**	1. How substitution can make non-integratible functions integratible. 2. How mean value and average value theorems are derived.

Stage Two—Assessment Evidence

Performance Tasks:

Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan

Unit 5: <mark>Logarithmic, Exponential, and Other Transcendental Functions</mark>

Brief Summary of Unit
Students will learn how to differentiate and integrate various transcendental functions including Log, Ln, e^x and a^x.

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

1. Solve logarithmic and exponential functions
2. Differentiate and integrate exponential and logarithmic functions
3. Evaluate the integrals of complex trig and arctrig functions.
4. Apply the properties of integrals to find more complex integrals
5. Solve physics problems using the antiderivative.
6. Use the substitution method on rational functions to create integrals of 1/x problems.

Understandings:	**Essential Questions:**
1. **The rule for derivatives of logs.** 2. **Integration problems in the form 1/x and the problem with using the anti-derivative** 3. **Derivative and integral of the natural exponential function** 4. **Derivative and integral of any exponent function** 5. **Integrals of other trig functions and arctrig functions.** 6. **Using the substitution method on rational functions.**	1. How do you know which integration rule to use when doing the derivative of an exponential functions. 2. How do you apply the integration rules when doing real world problems?

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)
Stage Three—Learning Plan

Unit 6:

Brief Summary of Unit

Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 7.	

Understandings:
 	
    7.
	Essential Questions:
	
	    3.

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)
Stage Three—Learning Plan

Unit 7:

Brief Summary of Unit

Stage One—Desired Results	
Established Goals: (Standards of Learning, Content Standards) 8.	

Understandings:
 	
    8.
	Essential Questions:
	
	    4.

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)
Stage Three—Learning Plan

Unit 8:

Brief Summary of Unit

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

   9.

Understandings:	**Essential Questions:**
9.	**5.**

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)
Stage Three—Learning Plan

Unit 9:

Brief Summary of Unit

Stage One—Desired Results

Established Goals: (Standards of Learning, Content Standards)

   10.

Understandings:	**Essential Questions:**
10.	**6.**

Stage Two—Assessment Evidence
Performance Tasks:
Other Evidence: :(quizzes, tests and so on)

Stage Three—Learning Plan