Pine Hill Public Schools Curriculum				
Content Area:	**Mathematics**			
Course Title/ Grade Level:	**AP Calculus**			
Unit 1:	**Introduction to Calculus**	Month:	**September**	
Unit 2:	**Limits, Asymptotes, and Continuity**	Month:	**September**	
Unit 3:	**Differentiation**	Month:	**October to November**	
Unit 4:	**Applications of Differentiation**	Month:	**November to December**	
Unit 5:	**Integration**	Month:	**January to March**	
Unit 6:	**Applications of Integration**	Month:	**March to April**	
Unit 7:	**AP Review**	Month:	**April/May**	
Unit 8:	**Miscellanious (Exponetial Decay, Integration by Parts, (more) Applications of Derivatives, Arc-Length, Volumes (using washer))**	Month:	**May/June**	
Date Created or Revised:	August 12th, 2013			
BOE Approval Date:	8/27/13			

<table>
<tr><td colspan="3" align="center">**Pine Hill Public Schools**
Curriculum</td></tr>
<tr><td>**Unit Title:**</td><td>**Introduction to Calculus**</td><td>**Unit #: 1**</td></tr>
<tr><td colspan="2">**Course or Grade Level: AP Calculus**</td><td>**Length of Time: 4 days**</td></tr>
<tr><td colspan="2">**Date Created: August 12th, 2013**</td><td>**BOE Approval Date:**</td></tr>
<tr><td>**Pacing**</td><td colspan="2">1 day Introducing Instantaneous Rate of Change, 1 day Learning to Work with Area, 1 day Exploration of Integrals, 1 day Introduction to Limits</td></tr>
<tr><td>**Essential Questions**</td><td colspan="2">• How can we estimate the area under a curve using geometric shapes?
• What do we mean by instantaneous rate of change?
• What is the slope of the tangent line?
• What do we mean by limit?</td></tr>
<tr><td>**Content**</td><td colspan="2">Instantaneous Rate of Change, Area , Integrals, Limits</td></tr>
<tr><td>**Skills**</td><td colspan="2">• Approximate Instantaneous Rate of Change, Area under a curve ie. integrals, and Limits</td></tr>
<tr><td>**Assessments**</td><td colspan="2">• Formative: Teacher observation, Classwork, Homework</td></tr>
<tr><td>**Inter-disciplinary Connections**</td><td colspan="2">• Physics: Students will use data about a baseball to determine the approximate speed the ball was travelling at a specific time (ie. instantaneous rate of change)</td></tr>
<tr><td>**Lesson resources / Activities**</td><td colspan="2">• personally made worksheets
• Assorted resources found online</td></tr>
<tr><td colspan="3" align="center">**Common Core State Standards**</td></tr>
<tr><td colspan="3">**Grade or Conceptual Category (HS only): AP Calculus**</td></tr>
<tr><td colspan="3">**Domain (name and #): Interpreting Functions; Linear, Quadratic, and Exponential Models; Trigonometric Functions**</td></tr>
<tr><td>**Cluster: Interpret functions that arise in applications in terms of the context.**</td><td colspan="2">**#. Standard:**</td></tr>
<tr><td></td><td colspan="2">F-IF-6</td></tr>
<tr><td>**Analyze functions using different representations.**</td><td colspan="2">F-IF-7.a.b.c.d.e</td></tr>
<tr><td>**Construct and compare linear, quadratic, and exponential models and solve problems**</td><td colspan="2">F-LE-2
F-LE-4</td></tr>
<tr><td>**Extend the domain of trigonometric functions using the unit circle.**</td><td colspan="2">F-TF-2
F-TF-3
F-TF-5</td></tr>
</table>

Model periodic phenomena with trigonometric functions			

Pine Hill Public Schools Curriculum	

Unit Title: Limits, Asymptotes, and Continuity	**Unit #: 2**

Course or Grade Level: AP Calculus	**Length of Time: 13 days**

Date Created: August 12th, 2013	**BOE Approval Date:**

Pacing	2 days Rates of Change and Limits, 3 days Limits Involving Infinity, 3 days Continuity, 3 days Rates of Change and Tangent Lines, 2 days Review and Test
Essential Questions	• What is a limit? • When does a limit not exist? • How do you find a limit with a table? • How do you find a limit with a Graph? • How do you find a limit with a Analytically? • What is continuity? • How are limits and continuity related?
Content	• Asymptotic and Unbounded behavior, Limits of functions (including one-sided limits), Continuity as a property of functions
Skills	• Calculate limits, identify vertical and horizontal asymptotes. • Identify the intervals upon which a given function is continuous
Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework
Inter-disciplinary Connections	• Biology: students will see that if you take a drug daily the amount of the drug initially builds up and the levels out as time goes on (ie. maintains a horizontal asymptote as t approaches infinity)
Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapter 2 • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards	

Grade or Conceptual Category (HS only): AP Calculus	

Domain (name and #): Interpreting Functions	

Cluster: Interpret functions	**#. Standard:**

		F-IF-6	
that arise in applications in terms of the context			

Pine Hill Public Schools **Curriculum**	
Unit Title: **Differentiation**	**Unit #: 3**
Course or Grade Level: AP Calculus	**Length of Time: 31 days**
Date Created: August 12th, 2013	**BOE Approval Date:**

Pacing	3 days Derivative of a Function, 3 days Differentiability, 4 days Rules for Differentiation (product, quotient, etc, 3 days Velocity and Other Rates of Change, 2 days Review and Test, 3 days Derivatives of Trigonometric Functions, 3 days The Chain Rule, 2 days Implicit Differentiation, 2 days Derivatives of Inverse Trigonometric Functions, 4 days Derivatives of Exponential and Logarithmic Functions, 2 days Review and Test
Essential Questions	• How do you find the derivative of a function at a point? • What is the Sum/Difference/Product/Quotient/Chain Rule for derivatives? When should the Sum/Difference/Product/Quotient/Chain rule be used? • What are the rules for differentiating polynomial/trigonometric/exponential/logarithmic/ inverse-trigonometric functions? When can implicit differentiation be used?
Content	• Concept of the derivative, Derivative at point, Derivative as a function, Computation of Derivatives, Second Derivatives, Implicit Differentiation
Skills	• Find out where a function is not differentiable and distinguish between corners, cusps, discontinuities, and vertical tangents. • Use the rules of differentiation (sum, difference, product, quotient, and chain) to Calculate derivatives, including second and higher order derivatives and implicit differentiation. • Calculate the derivatives of functions involving the inverse trigonometric functions, rational powers of x, trigonometric functions, exponential functions, and logarithmic functions.
Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework
Inter-disciplinary Connections	• Physics: compute the velocity and acceleration of an object.
Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapter 3 • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards						
Grade or Conceptual Category (HS only): AP Calculus						
Domain (name and #): Interpreting Functions						
Cluster: Interpret functions that arise in applications in terms of the context	**#. Standard:**					
	F-IF-6					
21st Century Themes						
	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy	Health Literacy
21st Century Skills						
	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration	Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills	

Pine Hill Public Schools Curriculum		
Unit Title:	**Applications of Differentiation**	**Unit #: 4**
Course or Grade Level: AP Calculus		**Length of Time: 24 days**
Date Created: August 12th, 2013		**BOE Approval Date:**
Pacing	5 days Extreme Values of Functions, 2 days Mean Value Theorem, 4 days Connecting f' and f'' with the Graph of f, 2 days Review and Test, 3 days Modeling and Optimization, 3 days Linearization and Newton's Method, 3 days Related Rates, 2 days Review and Test	
Essential Questions	• What are critical numbers and what can they tell us? How can the derivative be used to describe the behavior of a function? What does it mean for a function to have absolute or local extrema? What is meant by the concavity of a graph?	
Content	• Mean Value Theorem, Extreme Values, Optimization, Related Rates	
Skills	• Find the equations of the tangent line and the normal line to a curve at a given point. • Determine the local or global extreme values of a function. • Apply the Mean Value Theorem and find the intervals on which a function is increasing or decreasing. • Use the first and second derivative tests to determine the local extreme values of a function. • Determine the concavity of a function and locate the points of inflection by analyzing the second derivative, • Graph f using information about f'. • Solve related rates problems. • Find linearization's and use Newton's method to approximate the zeros of a function.	
Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework	
Inter-disciplinary Connections	• Economics: Find the maximum profit. Find the minimum cost.	

Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapter 4 • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards

Grade or Conceptual Category (HS only): AP Calculus

Domain (name and #): Interpreting Functions

Cluster: Interpret functions that arise in applications in terms of the context	#. Standard:
	F-IF-6

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy

21st Century Skills

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Pine Hill Public Schools Curriculum			
Unit Title: Integration		**Unit #: 5**	
Course or Grade Level: AP Calculus		**Length of Time: 38 days**	
Date Created: August 12th, 2013		**BOE Approval Date:**	
Pacing	3 days Estimating with Finite Sums, 4 days Definite Integrals, 4 days Integral as Net Change, 7 days Definite Integrals and Antiderivatives, 3 days Review and Test, 3 days Trapezoidal Rule, , 7 days Definite Integrals and Antiderivatives, 4 days Antidifferentiation by Substitution, 3 days Review and Test		
Essential Questions	• What is integration and how is it applied? • What are the different techniques for integration and how does one know when to apply each one?		
Content	• Riemann sums, Definite Integrals, Indefinite Integrals, Antidifferentiation, Numerical Approximations		
Skills	• Construct Antiderivatives of polynomials, exponential, and trigonometric functions • Compute indefinite and definite integrals by using the substitution method.		
Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework		
Inter-disciplinary Connections	• Compute the total amount of customers over a period of time. (or any change over time)		
Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapters 5 and 6 (section 2 only) • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online		

	• Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards

Grade or Conceptual Category (HS only): AP Calculus

Domain (name and #): Interpreting Functions

Cluster: Interpret functions that arise in applications in terms of the context	**#. Standard:**
	F-IF-6

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Pine Hill Public Schools Curriculum	

Unit Title: **Applications of Integration**	**Unit #: 6**

Course or Grade Level: AP Calculus	**Length of Time: 24 days**

Date Created: August 12th, 2013	**BOE Approval Date:**

Pacing	4 days Slope Fields, 5 days The Fundamental Theorem of Calculus, 3 days Areas in the Plane, 5 days Volumes, 2 days Average Value of a Function, 2 days Exponential Growth and Decay (only the basics needed for the AP test), 3 days Review and Test
Essential Questions	• How can we estimate the area under a curve using geometric shapes? • How do limits related to areas under curves?
Content	• The Fundamental Theorem of Calculus, Area under/between curves, Volume of a solid
Skills	- Compute the area under a curve by using a numerical integration procedure. - Compute volumes using integration techniques. - Apply the Fundamental Theorem of Calculus. - Apply rules for definite integrals and find the average value of a function over a closed interval. - Solve initial value problems.
Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework
Inter-disciplinary Connections	• Compute the work done by integrating a position function (ie. finding the area under a curve).

Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapters 6 and 7 • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards

Grade or Conceptual Category (HS only): AP Calculus

Domain (name and #): Interpreting Functions

Cluster: Interpret functions that arise in applications in terms of the context	#. Standard:
	F-IF-6

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy

21st Century Skills

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Pine Hill Public Schools Curriculum		
Unit Title: **AP Review**		**Unit #: 7**
Course or Grade Level: AP Calculus	**Length of Time: about 20 days**	
Date Created: August 12th, 2013	**BOE Approval Date:**	
Pacing	10 days Open Ended Review, 10 days Multiple Choice Review	
Content	• Asymptotic and Unbounded behavior, Limits of functions (including one-sided limits), Continuity as a property of functions, Concept of the derivative, Derivative at point, Derivative as a function, Computation of Derivatives, Second Derivatives, Mean Value Theorem, Extreme Values, Optimization, Implicit Differentiation, Related Rates, Riemann sums, Definite Integrals, Indefinite Integrals, The Fundamental Theorem of Calculus, Antidifferentiation, Numerical Approximations, Area under/between curves, Volume of a solid	
Essential Questions	• How do you find a limit with a table? • How do you find a limit with a Graph? • How do you find a limit with a Analytically? • What are the different techniques for integration and how does one know when to apply each one? • How do you find the derivative of a function at a point? • What is the Sum/Difference/Product/Quotient/Chain Rule for derivatives? When should the Sum/Difference/Product/Quotient/Chain rule be used? • What are the rules for differentiating polynomial/trigonometric/exponential/logarithmic/ inverse-trigonometric functions? When can implicit differentiation be used? • How can the derivative be used to describe the behavior of a function? • What does it mean for a function to have absolute or local extrema? • What is meant by the concavity of a graph?	
Skills	• Apply rules for definite integrals and find the average value of a function over a closed interval. • Express the area under a curve as a definite integral and as the limit of an infinite Riemann sum.	

	• Compute the area under a curve by using a numerical integration procedure. • Apply the Fundamental Theorem of Calculus. • Construct Antiderivatives of polynomials, exponential, and trigonometric functions using the FTC. • Solve initial value problems. • Compute indefinite and definite integrals by using the substitution method.
Assessments	• Formative: Teacher observation, Classwork, Homework
Lesson resources / Activities	• personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Pine Hill Public Schools **Curriculum**	
Unit Title: Miscellaneous (Exponential Decay, Integration by Parts, Applications of Derivatives, Arc-Length, Volumes (using washer))	**Unit #: 8**
Course or Grade Level: AP Calculus	**Length of Time: 17 days**
Date Created: August 12th, 2013	**BOE Approval Date:**

Pacing	3 days Exponential Decay (revisited), 3 days Integration by Parts, 6 days Applications of Derivatives, 3 days Arc-Length, Volumes (using shells)), 2 days Review and Test
Essential Questions	• What kind of real world situations can exponential growth and decay represent? • What is a logarithm? • How can the derivative be used to describe velocity and acceleration? • How do you apply derivatives to solve real-life problems?
Content	• Modeling, Definite Integrals, Indefinite Integrals, Volume of a solid
Skills	• Solve application problems involving finding minimum or maximum values of functions. • Compute indefinite and definite integrals by parts. • Compute Arc-Length. • Find volumes of irregular shapes using the shells method.

Assessments	• Summative: Tests and benchmark • Formative: Teacher observation, Classwork, Homework
Inter-disciplinary Connections	• Business: Students will be able to find the minimum amount of packing material needed to contain a certain volume. Students will be able to maximize profit or minimize cost given specific models/conditions.
Lesson resources / Activities	• Prentice Hall Calculus , copyright 2003 – Chapters 3, 4, 5, 6, and 7 • Power point resources and worksheets • Textbook practice worksheets and personally made worksheets • Assorted resources found online • Supplementary AP Calculus Material from College Board, Baron's, and Kaplan

Common Core State Standards

Grade or Conceptual Category (HS only): AP Calculus

Domain (name and #): Interpreting Functions

Cluster: Interpret functions that arise in applications in terms of the context	#. Standard:
	F-IF-6

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy

21st Century Skills

	Creativity and Innovation		Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		