

# **Glen Ridge Public Schools –Mathematics Curriculum**



**Course Title: AP Calculus BC**

**Subject: Mathematics**

**Grade Level: 12th**

**Duration: Full Year**

**Prerequisite: Pre- Calculus Honors grade of “A-” or better; Teacher Recommendation**

**Elective or Required: Elective**

## **Mathematics Mission Statement**

Mathematics is an integral part of our lives. Students must be actively involved in their mathematics education through the use of modeling and demonstrating the ability to persevere through problem solving. The mathematics curricula will emphasize critical thinking skills through a balance of logic and reasoning, attention to precision by utilizing patterns and structure, and bridging these ideas to cross-curricular learning. Students will be engaged and challenged in a student-centered learning environment that is developmentally appropriate and will communicate mathematical ideas, both in a verbal and written form. Through effectively applying hands-on manipulatives, basic computation skills and the use of technical writing to justify their processes, students will critique the work of themselves and others.

## **Course Description:**

AP Calculus BC is roughly equivalent to both first and second semester college Calculus courses and extends the content learned in AB to include parametric equations, vectors, and polar functions. The BC course covers topics in differential and integral calculus, including concepts and skills of limits, derivatives, definite integrals, the Fundamental Theorem of Calculus, sequences and series, and L’Hospital’s Rule. The course teaches students to examine Calculus graphically, numerically, analytically, and verbally. There is strong emphasis on making connections amongst these representations. Students learn how to use technology to help solve problems, experiment, interpret results, and support conclusions. BC Calculus is a fast- paced course, only recommended for students with a solid work ethic and deep desire to study Calculus at a more advanced level.

**Author:** Cluny Mendez  
**Date Submitted:** Summer 2017

## **AP Calculus BC**

### **Topic/Unit: Prerequisites for Calculus**

**Approximate # Of Weeks: 1 week**

#### **Essential Questions:**

What are the parts of each type of equation of a line?

What is a function and why is it significant?

What are the basic functions and what do their graphs look like?

What is a parametric equation?

How do you find a Cartesian equation form a parametrized curve?

Can you use the trigonometric functions in problem solving situations?

Can you graph the 6 basic trig functions?

How do you find an inverse of a function and why is it significant?

**NJCCS:** A-SSE 3, 4, 5. A-APR 2, 3, 4. A-REI 1, 2, 3, 4, 5, 6, 7, 10, 11, 12. F-IF 1, 2, 3, 4, 5, 6, 7, 8, 9. F- BF 1a, 1c, 3, 4, 5. F-LE 1, 2, 3, 4, 5

#### **Upon completion of this unit students will be able to:**

- Write an equation of a line in any form.
- Identify and graph all the different types of functions.
- Identify the types of parametric graphs.
- Find the Cartesian equation for a parametrized curve.
- Solve any trigonometric equation.
- Graph any trigonometric function.
- Solve problems involving inverses.

#### **Interdisciplinary Standards (njcccs.org)**

- Standard 9.1 21<sup>st</sup> –Century Life & Career Skills
- Standard 5.1 Science Practices

#### **Activities – include 21<sup>st</sup> Century Technologies:**

- Students will participate and takes notes on Smartboard Lessons and activities.
- Students will compare graphs with each other and discuss correct graphing techniques of functions.
- Students will work on problem sets independently, discuss findings in small groups, then review and reinforce as a class.

**Enrichment Activities:**

- Students will be introduced to the AP Exam and see how important their understanding of functions and equations is by highlighting and identifying questions that involve these topics.

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- Textbook Chapter 1

**Prerequisite Learning Goals Self-Assessment Chart**

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• Write equations of lines</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Graph basic functions</li> <li>• Prove functions are inverses</li> <li>• Solve trig equations</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Find inverses</li> <li>• Problem solve with functions</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Find a Cartesian equation for a curve that contains the parametrized curve</li> <li>• Find a parametrization for a curve</li> </ul>	

# AP Calculus BC

## Topic/Unit: Limits and Continuity

**Approximate # Of Weeks: 2 weeks**

### Essential Questions:

What is the difference between average rate of change and instantaneous rate of change?

How do you evaluate a limit graphically and algebraically?

How do limits involving infinity work?

What is continuity?

If a function isn't continuous how do you evaluate one and two-sided limits?

How do limits and slopes of tangent lines relate to each other?

Can you apply limit properties to a function to find the equation of a tangent line?

*NJCCS:* N-Q 1, 2, 3. A-SSE 3a. F-IF 1, 2, 4, 5, 6, 7, 9.

### Upon completion of this unit students will be able to:

- Calculate average and instantaneous rates of change.
- Evaluate limits graphically and algebraically.
- Evaluate limits at infinity and infinite limits.
- Identify if a function is continuous or not.
- Evaluate “zero over zero” type of limits.
- Find the slope of a tangent line at a point on a function.
- Write an equation for the line tangent to a function.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> –Century Life & Career Skills
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete piecewise graphing activity.
- Students will complete “Zero over zero” worksheet in groups.
- Students will work on and complete classwork and homework problems independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.

### Enrichment Activities:

- Blog responses to finding certain types of functions.

### Methods of Assessments/Evaluation:

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

### Resources/Including Online Resources

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• Calculate average rate of change</li> <li>• Evaluate limits graphically</li> <li>• Evaluate limits algebraically</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Evaluate limits involving infinity</li> <li>• Identify a function's points of discontinuity</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Evaluate 0/0 limits</li> <li>• Find the slope of a tangent line</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Write an equation of a tangent line in any form</li> </ul>	

# AP Calculus BC

## Topic/Unit: Derivatives

**Approximate # Of Weeks: 4 weeks**

### Essential Questions:

What is a derivative?

How do you find the derivative of a function using the definition of the derivative?

How do you graph a function's derivative?

How do you take a function's derivative and find the graph of the original function?

When does  $f'(x)$  fail to exist?

How are continuity and differentiability related?

Can you apply all the different rules to finding the derivatives or more complex functions?

How are derivatives applied to position, velocity and acceleration functions?

What are the derivatives of the trigonometric functions?

How are the derivatives of the trig functions related to each other?

*NJCCS:* N-Q 1, 2, 3. A-CED 1, 2, 3, 4. A-REI 1, 3, 6, 7, 10, 11, 12. F-IF 1, 2, 4, 5, 6, 7, 8, 9. F-BF 3. F-TF 1, 3.

### Upon completion of this unit students will be able to:

- Find the derivatives of functions using the definition.
- Graph a function's derivative and the original function from the derivative.
- Explain where and why a derivative may fail to exist.
- Apply the Intermediate Value Theorem for derivatives to problem solving situations.
- Apply the rules for differentiation to finding derivatives of functions.
- Problem solve in situations involving position, velocity and acceleration functions.
- Find the derivatives of the trigonometric functions.
- Use the ti-89 to find derivatives.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete an activity with graphing functions and their derivatives.

- Students will complete the matching derivatives and their functions activity.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use their Ti-89 to find derivatives.

**Enrichment Activities:**

- Advanced calculator activity for finding higher order derivatives.

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 3

Learning Level	Objectives	Assessment 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• Use the definition to find derivatives</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Graph a function's derivative and graph the original function from the derivative</li> <li>• Explain where derivatives may fail to exist</li> <li>• Find the derivatives of the trig functions</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Apply the Intermediate Value Theorem</li> <li>• Use rules for differentiating</li> </ul>	

4	<ul style="list-style-type: none"><li>• Use derivatives to problem solve with position, velocity, and acceleration</li></ul>	
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# AP Calculus BC

## Topic/Unit: More Derivatives

**Approximate # Of Weeks: 2 weeks**

### Essential Questions:

How do you apply the Chain Rule to finding the derivatives of composite functions?

How do you find the slopes of parametrized curves?

What is implicit differentiation?

How do you find the derivatives of the inverse trig functions?

What are the derivatives of exponential and logarithmic functions?

**NJCCS:** N-Q 1, 2, 3. A-CED 1, 2, 3, 4. A-REI 10, 11, 12. F-IF 1, 2, 4, 5, 6, 7, 8, 9. F-BF 1c, 3, 4, 5. F-LE 1, 2, 3, 4. F-TF 1, 3.

### Upon completion of this unit students will be able to:

- Find the derivatives of composite functions.
- Find the slopes of parametrized curves.
- Differentiate implicitly.
- Derive and find the derivatives of the inverse trig functions.
- Find the derivatives of exponential and logarithmic functions.
- Use the derivatives in problem solving situations.
- Find the graphs and derivatives on the Ti- 89 graphing calculator.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- **Standard 9.1 21<sup>st</sup> Century Life & Career Skills**
- **Standard 8.1- Computer and Information Literacy**
- **Standard 8.2- Technology Education**
- **Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century**
- **Standard 5.1 Science Practices**

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete discovery activity with graphing exponential functions and their derivatives.
- Students will complete the matching derivatives and their functions activity.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use their Ti-89 to find derivatives.

**Enrichment Activities:**

- Chain Rule Activity

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 4

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Use the chain rule to find derivatives</li> <li>• Find the derivatives of exponential and logarithmic functions</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Use implicit differentiation</li> <li>• Find the derivatives of the inverse trig functions</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Find the slopes of parametrized curves</li> <li>• Problem solve with derivatives</li> </ul>	

# AP Calculus BC

## Topic/Unit: Applications of Derivatives

**Approximate # Of Weeks: 4 weeks**

### Essential Questions:

How do you find the extreme values of functions?

What's the difference between critical values and extreme values?

What's the difference between a local extreme value and an absolute extreme value?

How do you apply the Mean Value Theorem?

What is the connection between the graphs of  $f$ ,  $f'$  and  $f''$ ?

What are the steps for using derivatives to model and optimize?

What are the steps to use derivatives to solve related rate problems?

*NJCCS*: N-Q 2, 3. A-CED 1, 2, 3, 4. G-MG 1, 2, 3

### Upon completion of this unit students will be able to:

- Find extreme values of functions.
- Apply the Mean Value Theorem.
- Connect the graphs of functions and their derivatives.
- Problem solve with derivatives.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use their Ti-89 to problem solve.

### Enrichment Activities:

- Related Rates Lab Activity

### Methods of Assessments/Evaluation:

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

### Resources/Including Online Resources

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 5

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• Find critical values</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Find extreme values</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Connect the graphs of <math>f</math>, <math>f'</math>, <math>f''</math></li> </ul>	
4	<ul style="list-style-type: none"> <li>• Problem solve with optimization</li> <li>• Problem solve with Related Rates</li> </ul>	

# AP Calculus BC

## Topic/Unit: The Definite Integral

**Approximate # Of Weeks: 4 weeks**

### Essential Questions:

What are the three rectangular approximation methods and what are they used for?

What is the definition of the definite integral?

What does an antiderivative of a function give?

How do you define and apply the Fundamental Theorem of Calculus?

How do you calculate the area under a curve by applying the Trapezoidal Rule?

What is the relationship between the Trapezoidal Rule and LRAM and RRAM??

*NJCCS:* N-Q 2, 3. A-CED 1, 2, 3, 4. F-IF 4, 5, 7, 8. G-MG 1.

### Upon completion of this unit students will be able to:

- Approximate areas under a curve 4 different ways.
- Find the exact area under a curve by evaluating a definite integral.
- Find antiderivatives of functions.
- Define and apply the Fundamental Theorem of Calculus.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1 Computer and Information Literacy
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete The Pump and The Airplane problems to introduce areas under a curve.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use their Ti-89 to integrate problems that cannot be done by hand.

### Enrichment Activities:

- Simpson's Rule Activity

### Methods of Assessments/Evaluation:

- Pair/ Share
- Revisit Essential Questions
- Unit test

- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 6

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Use the rectangular approximation methods to approximate area under a curve</li> <li>• Use the Trapezoidal Rule to approximate the area under the curve</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Evaluate definite integrals</li> <li>• Use the Fundamental Theorem of Calculus</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Find anti-derivates</li> </ul>	

# AP Calculus BC

## Topic/Unit: Differential Equations and Mathematical Modeling

**Approximate # Of Weeks: 5 weeks**

### Essential Questions:

How do you graph a slope field?

How does an initial condition impact the graph of your slope field?

When do you use anti-differentiation by substitution and how does it work?

How do you solve exponential growth and decay problems by applying antidifferentiation rules?

*NJCCS:* N-Q 2, 3. A-CED 1, 2, 3, 4. F-IF 4, 5, 7, 8. F-LE 1, 2, 3, 4, 5. G-MG 1.

### Upon completion of this unit students will be able to:

- Graph slope fields.
- Overlay solutions on slope fields.
- Anti-differentiate but substitution.
- Anti-differentiate by parts.
- Solve real world problems involving growth and decay.
- Use partial fractions to anti-differentiate by parts.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete introductory activities for slope fields.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.

### Enrichment Activities:

- Activity using the Ti- 89 to draw slope fields.

### Methods of Assessments/Evaluation:

- Pair/ Share
- Revisit Essential Questions

- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

### Resources/Including Online Resources

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 7

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• Graph slope fields</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Overlay solutions on slope fields</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Anti-differentiate by substitution</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Anti-differentiate by parts</li> <li>• Use partial fractions to anti-differentiate</li> <li>• Problem solve with growth and decay</li> </ul>	



# AP Calculus BC

## Topic/Unit: Applications of Definite Integrals

**Approximate # Of Weeks: 4 weeks**

### Essential Questions:

How do you describe an integral as net change?

How do you calculate the areas in a plane by using integrals?

How do you calculate the volumes of solids formed by areas?

How do you calculate the volumes of solids formed by revolving areas around axes?

How do you find the length of a smooth curve?

**NJCCS:** N-Q 2, 3. A-CED 1, 2, 3, 4. F-IF 4, 5, 7, 8. F-LE 1, 2, 3, 4, 5. G-GMD 4. G-MG 1.

### Upon completion of this unit students will be able to:

- Apply properties of definite integrals to solving rate problems.
- Calculate the areas in planes by using integrals.
- Calculate volumes of cross sectional areas of different shapes.
- Calculate volumes of revolution.
- Find the length of a smooth curve.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete integral as net change activities.
- Students will explore different shapes that give a cross sectional area.
- Students will revolve areas around axes and calculate their volumes.
- Students will work independently and in small groups.
- Students will discuss solutions to problems in small groups and then as a class.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use the Ti-89 graphing calculator to problem solve.

### Enrichment Activities:

- L'Hospital's Rule activity

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 8

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Use the integral to find net change</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Use integrals to build volumes out of areas</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Use integrals to find volumes of revolution</li> <li>• Use integrals to find the length of a curve</li> </ul>	

# AP Calculus BC

## Topic/Unit: Sequences, L'Hospital's Rule, and Improper Integral

**Approximate # Of Weeks: 3 weeks**

### Essential Questions:

What types of sequences are there?

How do you find the limit of a sequence?

When is L'Hospital's Rule used?

What is an improper integral?

How do you evaluate integrals involving infinity?

*NJCCS:* N-Q 2, 3. A-CED 1, 2, 3, 4. F-IF 4, 5 F-BF 2 F-LE 1, 2, 3, 4, 5.

### Upon completion of this unit students will be able to:

- Define the types of sequences.
- Evaluate limits for sequences.
- Use L'Hospital's Rule to evaluate limits.
- Evaluate improper integrals.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will complete sequences activity.
- Students will explore difference sequences and their limits.
- Students will evaluate limits using L'Hospital's Rule.
- Students will discuss problems of improper integrals.
- Students will problem solve with improper integrals and their application to growth and decay problems.
- Students will use the Ti-89 graphing calculator to problem solve.

### Enrichment Activities:

- Growth and decay problem solving.

### Methods of Assessments/Evaluation:

- Pair/ Share
- Revisit Essential Questions

- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

### Resources/Including Online Resources

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 9

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	
2	<ul style="list-style-type: none"> <li>• None</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Problem solve with sequences</li> <li>• Use L'Hospital's rule to deal with indeterminate forms</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Evaluate improper integrals</li> </ul>	

# AP Calculus BC

## Topic/Unit: Infinite Series

**Approximate # Of Weeks: 3 weeks**

### Essential Questions:

What is an infinite series?

How do you find the interval of convergence?

What is a Taylor Series?

How does a Maclaurin Series relate to a Taylor Series?

How do you test convergence at endpoints?

*NJCCS:* N-Q 2, 3. A-CED 1, 2, 3, 4. F-IF 1, 2, 3, 4, 5 F-BF 2 F-LE 1, 2, 3, 4, 5.

### Upon completion of this unit students will be able to:

- Evaluate problems involving infinite series.
- Use Taylor Series to rewrite infinite series.
- Find the interval of convergence for an infinite series.
- Determine when a series diverges.
- Test the endpoints of a series for convergence.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will identify power series.
- Students will find a power series by differentiation.
- Students will use the Taylor Series.
- Students will find partial sums.
- Students will find the interval of convergence.
- Students will test the end points of a series for convergence.
- Students will watch and draw conclusions from demonstrations using Calculus in Motion.
- Students will use the Ti-89 graphing calculator to problem solve.

### Enrichment Activities:

- Students will use a the n-th Roots Test for convergence.

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 10

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> 4 I can teach others 3 I can pass an assessment 2 I need more practice 1 I don't understand
1	<ul style="list-style-type: none"> <li>• None</li> </ul>	
2	<ul style="list-style-type: none"> <li>• Determine when a series converges or diverges</li> </ul>	
3	<ul style="list-style-type: none"> <li>• Problem solve with infinite series</li> <li>• Find the interval of convergence</li> <li>• Find the radius of convergence</li> </ul>	
4	<ul style="list-style-type: none"> <li>• Rewrite infinite series using Taylor Series</li> <li>• Test convergence at endpoints</li> </ul>	

# AP Calculus BC

## Topic/Unit: Parametric, Vector and Polar Functions

**Approximate # Of Weeks: 4 weeks**

### Essential Questions:

What is a parametric function and how is it defined?

What is a vector?

How do you relate the position, velocity, acceleration and direction of motion vectors to the original vector?

What is a polar function and how does it relate to rectangular form?

How do you calculate the slopes of a polar curve?

How do you calculate the area between the curve of a polar equation?

*NJCCS:* N-Q 2, 3. N-VM 1, 2, 3, 4, 5. A-CED 1, 2, 3, 4. F-IF 1, 2, 3, 4, 5. F-LE 1, 2, 3, 4, 5.

### Upon completion of this unit students will be able to:

- Define a parametric equation.
- Define and use vectors in problem solving.
- Relate position, velocity, acceleration and direction of motion vectors.
- Convert polar equations to rectangular form.
- Find the slope of a polar curve.
- Calculate the area between the curve of a polar equation.

### Interdisciplinary Standards ([njcccs.org](http://njcccs.org))

- Standard 9.1 21<sup>st</sup> Century Life & Career Skills
- Standard 8.1- Computer and Information Literacy
- Standard 8.2- Technology Education
- Standard 6.3 Active Citizenship in the 21<sup>st</sup> Century
- Standard 5.1 Science Practices

### Activities – include 21<sup>st</sup> Century Technologies:

- Students will take notes and participate in Smartboard Lessons.
- Students will find the length of curves for parametric equations.
- Use vectors to problems solve.
- Graph polar equations.
- Find the area between the curves of a polar graph.
- Students will use the Ti-89 graphing calculator to problem solve.

### Enrichment Activities:

- Find the average value of  $r$  with respect to  $\theta$ .

**Methods of Assessments/Evaluation:**

- Pair/ Share
- Revisit Essential Questions
- Unit test
- Journals
- Multi- media Presentations
- Self-Assessments
- Think/Pair/Share
- Homework
- Classwork
- Independent work
- Observation
- Weekly Assessments

**Resources/Including Online Resources**

- Online Textbook Information
- Teacher Webpage
- AP Prep Test Questions
- Textbook Chapter 11

<b>Learning Level</b>	<b>Objectives</b>	<b>Assessment</b> <b>4 I can teach others</b> <b>3 I can pass an assessment</b> <b>2 I need more practice</b> <b>1 I don't understand</b>
1	<ul style="list-style-type: none"><li>• None</li></ul>	
2	<ul style="list-style-type: none"><li>• Convert polar equations to rectangular equations</li></ul>	
3	<ul style="list-style-type: none"><li>• Problem solve with vectors</li><li>• Find the slope of a polar curve</li></ul>	
4	<ul style="list-style-type: none"><li>• Calculate the area between polar curves</li></ul>	