

Saint Patrick High School

Curriculum Guide

Department:	Math	Grade and Level:	11 or 12
Class:	Advanced Placement Calculus	Term (Semester or Year):	Year

Required Text:	• Ron Larson <u>Calculus of a Single Variable</u> , 10th Edition (2014)
Additional Resources (i.e. texts, materials, apps, etc.):	<u>iPad Apps</u> <ul style="list-style-type: none">• Showbie• Good Reader <u>Other</u> <ul style="list-style-type: none">• Graphing Calculator

Course Description

This course follows the prerequisite Honors Algebra II/Trigonometry course and covers the balance of the pre-calculus concepts while introducing the calculus topics of the derivative and integral of all the standard functions as well as applications of areas, volumes, maxima and minima problems, and related rates. The course prepares the student for the annual Advanced Placement (AB Level) Calculus Test through which he may earn college credit. Four hours of college credit can be earned through enrollment in St. Mary's PACC Program.

Unit Themes (Table of Contents)

Theme 1:	Preparation for Calculus
Theme 2:	Limits and Their Properties
Theme 3:	Differentiation
Theme 4:	Applications of Differentiation
Theme 5:	Integration
Theme 6:	Logarithmic, Exponential, and Other Transcendental Functions
Theme 7:	Differential Equations (Section 6.2 only)

Agreed Upon Assessments

Forms of assessments may include but are not limited to....

- Daily Homework Assignments
- Daily Homework Quizzes
- Section Quizzes
- Unit Exam

Research and Writing Expectations

- Homework questions typically require written explanations as to why a given statement is true or false. These explanations must be formatted using complete and accurate statements, with examples included as necessary.
- Students are often required to work out the proof of a given theorem when it is introduced.

Unit: 1	Preparation of Calculus	Duration:	2 weeks
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Essential Questions:

- How do we use graphs and models to determine the important characteristics of a given data set?
- What are the important characteristics of a Linear Function?
- What are the important characteristics of a Function?
- What are the important characteristics of each of the six trig functions, including graphs, identities, and all aspects of the unit circle?

Affirmation Statements:

Students will be able to...:

- Sketch the graph of an equation
- Find the intercepts of a graph
- Test a graph for symmetry with respect to an axis and the origin
- Find the points of intersection of two graphs
- Find the slope of a line passing through two points
- Write the equation of a line with a given point and slope
- Interpret slope as a ratio or a rate in a real-life application
- Sketch the graph of a linear equation in slope-intercept form
- Write equations of lines that are parallel or perpendicular to a given line
- Use function notation to represent and evaluate a function
- Find the domain and range of a function
- Sketch the graph of a function
- Identify different types of transformations of functions
- Classify functions and recognize combinations of functions
- Identify all 6 trig functions by formula using both triangles and circles
- Memorize and fill out a blank Unit Circle
- Use trig definitions and identities to simplify a trig expression and solve a trig equation

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit: 2	Limits and Their Properties	Duration:	3 weeks
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Essential Questions:

- What is meant by a limit?
- How do you evaluate a limit?
- When does a limit exist?
- What is meant by a one-sided limit?
- What are the properties of continuity?
- What is meant by an infinite limit?

Affirmation Statements:

Students will be able to...:

- Estimate a limit using a numerical or graphical approach
- Learn different ways a limit can fail to exist
- Study and use the formal definition of a limit
- Evaluate a limit using the properties of limits
- Develop and use a strategy for finding limits
- Evaluate a limit using dividing out and rationalizing techniques
- Evaluate a limit using the squeeze theorem
- Determine continuity at a point and continuity on an open interval
- Determine one-sided limits and continuity on a closed interval
- Use the properties of continuity
- Understand and use the intermediate value theorem
- Determine infinite limits from the right and the left
- Find and sketch the vertical asymptotes of the graph of a function

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit: 3	Differentiation	Duration:	4 weeks
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Essential Questions:

- What is a derivative?
- What is a tangent line?
- How do you find the derivative of a function?
- What is implicit differentiation?
- What are related rates?

Affirmation Statements:

Students will be able to...:

- Find the slope of a tangent line to a curve at a point
- Use the limit definition to find the derivative of a function
- Understand the relationship between differentiability and continuity
- Find the derivative of a function using the constant rule
- Find the derivative of a function using the power rule, constant multiple rule, and sum and difference rules
- Find the derivatives of the sine and cosine functions
- Use the derivative to find rates of change
- Find the derivative of a function using the product or quotient rule
- Find the derivative of a trig function
- Find a higher-order derivative of a function
- Find the derivative of a composite function using the chain rule
- Find the derivative of a function using the general power rule
- Simplify the derivative of a function using algebra
- Find the derivative of a trig function using the chain rule
- Distinguish between a function written in implicit and explicit form
- Use implicit differentiation to find a derivative
- Find a related rate
- Use related rates to solve real-life problems

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit: 4	Applications of Differentiation	Duration:	5 weeks
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Essential Questions:

- What are extrema?
- When is a function increasing? Decreasing? Concave up? Concave down?
- What is a relative minimum? Relative maximum? Point of inflection?
- What are limits at infinity?
- How do you sketch the graph of a function without technology?
- What are differentials?

Affirmation Statements:

Students will be able to...:

- Understand the definition of extrema of a function on an interval
- Understand the definition of relative extrema of a function on an open interval
- Find extrema on a closed interval
- Use Rolle's and the mean value theorems
- Determine intervals on which a function is increasing or decreasing
- Apply the first derivative test to find extrema of a function
- Determine the intervals a function is concave up or concave down
- Find any points of inflection of the graph of a function
- Apply the second derivative test to find relative extrema of a function
- Determine finite limits at infinity
- Find any horizontal asymptotes of the graph of a function
- Determine infinite limits at infinity
- Analyze and sketch the graph of a function
- Solve applied minimum and maximum problems
- Find the value of a differential

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit: 5	Definite and Indefinite Integration	Duration:	5 weeks
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Essential Questions:

- What is an antiderivative?
- What is a Riemann Sum
- What is a definite integral? Indefinite integral?
- What is integration by substitution?
- Can you estimate the value of an integral?

Affirmation Statements:

Students will be able to...:

- Write the general solution of a differential equation
- Use indefinite integral notation for antiderivatives
- Use basic integration rules to find antiderivatives
- Find a particular solution to a differential equation
- Use sigma notation to write and evaluate a sum
- Understand the concept of area
- Approximate the area of a plane
- Find the area of a plane region using limits
- Understand the definition of a Riemann sum
- Evaluate a definite integral using limits
- Evaluate a definite integral using properties of definite integrals
- Evaluate a definite integral using the Fundamental Theorem of Calculus
- Understand and use the Mean Value Theorem for Integrals
- Find the average value of a function over a closed interval
- Understand and use the Second Fundamental Theorem of Calculus
- Use pattern recognition to find an integral
- Use a change of variables to find an integral
- Use the general power rule for integration
- Evaluate an integral involving an odd or even function
- Approximate a definite integral using the trapezoid rule

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit: 6	Logarithmic, Exponential, and Other Transcendental Functions	Duration:	5 weeks
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Essential Questions:

- How do you find the derivative or integral of a log , natural log, e, or inverse trig function

Affirmation Statements:

Students will be able to...:

- Develop and use the properties of the natural log function
- Understand the definition of the number e
- Find derivatives of functions involving the natural log function
- Use the log rule for integration to integrate a rational function
- Integrate trig functions
- Verify that one function is an inverse of another function
- Determine whether a function has an inverse function
- Find the derivative of an inverse function
- Develop properties of the natural exponential function
- Differentiate natural exponential functions
- Integrate natural exponential functions
- Define exponential functions that have bases other than e
- Differentiate and integrate exponential functions that have bases other than e
- Use exponential functions to model compound interest and exponential growth
- Develop properties of the six inverse trig functions
- Differentiate an inverse trig function
- Review the basic differentiation rules
- Integrate inverse trig functions
- Use the method of completing the square to integrate a function
- Review the basic integration rules

Common Assessments:

- Daily lesson quizzes, section quizzes, daily homework, chapter test

Unit:		Duration:	
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Essential Questions:

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Affirmation Statements:

Students will be able to....:

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Common Assessments:

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Unit:		Duration:	
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Essential Questions:

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Affirmation Statements:

Students will be able to....:

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Common Assessments:

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Appendix

CCSS Resources

Common Core Website: <http://www.corestandards.org/read-the-standards/>

Common Core App:

Essential Questions

Essential Questions help structure and plan an academic unit. For information regarding developing Essential Questions, please refer to the file shared with you on Google Drive.

Affirmation Verbage (Action Words)

Examples of Action Verbs:

Discuss, recall, state, measure, identify, collect, create, hypothesize, analyze, identify, define, describe