

## Wilson Area School District Planned Course Guide

**Title of planned course:** Honors Calculus

**Subject Area:** Calculus

**Grade Level:** 11 - 12

**Course Description:** Honors Calculus is designed to give students an overview of various calculus topics. The concept of limits will be studied through graphical and algebraic analysis. Limits will lead into the study of derivatives where emphasis will be placed on applications of the derivative. The second half of the year will examine integration through important theorems and techniques. The process of integration will then transition into area and volumes of solids.

**Time/Credit for this Course:** One Full Academic Year / 1.0 Credit

**Curriculum Writing Committee:** Kimberly Kauffman

## Curriculum Map

**August:** Algebraic Concepts

**September:** Using a Graphing Calculator  
Limits and Properties of Limits

**October:** Differentiation  
Applications of Differentiation

**November:** Applications of Differentiation

**December:** Applications of Differentiation

**January:** Transcendental Functions and Their Derivatives  
Trigonometric Functions and Their Derivatives

**February:** Integration

**March:** Integration

**April:** Integrations  
Applications of Integration

**May:** Applications of Integration  
Differential Equations and Partial Fractions

**June:** Differential Equations and Partial Fractions

## Wilson Area School District Planned Course Materials

**Course Title:** Honors Calculus

**Textbook:** Calculus I with Precalculus, Third Edition  
Brooks/Cole Cengage Learning  
2012

**Supplemental Books:** Calculus – 3<sup>rd</sup> Edition (Sullivan and Miranda)  
Calculus – Early Transcendental Functions 9<sup>th</sup> Edition  
(Larson)

**Teacher Resources:** Kuta Software, Internet Resources

# Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 1 :** Algebraic Concepts and Functions

**Time frame:** 2 - 3 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Simplify complex fractions
- Utilize factoring to solve equations and inequalities
- Write equations of lines
- Rationalize a denominator

**Core Activities:** Students will complete/participate in the following:

- Define key terms relating to Algebra
- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Analyze problems and do one of the following:
  - a. find the mistake
  - b. determine the next step
  - c. give a reason that includes mathematical terminology to explain a particular step in the problem

**Extensions:** Utilize the graphing calculator to graph parallel and perpendicular lines

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 2:** Using a Graphing Calculator

**Time frame:** 2 - 3 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Use the table feature on the graphing calculator
- Find a maximum or minimum on the graphing calculator
- Find the zeros of a function on the graphing calculator
- Use the window and zoom commands effectively

**Core Activities:** Students will complete/participate in the following:

- Define commands relating to the graphing calculator
- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Practice problems / solving equations
- Connect algebra and the graph of a function using a graphing calculator

**Extensions:**

- Use the intersect command on the calculator
- Work with more challenging problems

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 3:** Limits and Properties of Limits

**Time frame:** 5 - 6 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Evaluate limits graphically and numerically
- Evaluate limits using algebraic concepts
- Find continuity at a point and on an interval
- Find one-sided limits
- Find infinite limits

**Core Activities:** Students will complete/participate in the following:

- Utilize the graphing calculator as an aid in finding limits
- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Limit Circuit

**Extensions:**

- Use the table on the calculator
- Work with more challenging problems

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

# Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 4:** Differentiation

**Time frame:** 15 - 16 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Use the definition of the derivative to find the slope of a tangent line
- Identify points on a graph where the derivative does not exist
- Find derivatives using the rules (basic, product, quotient, chain, implicit)
- Find higher-order derivatives
- Use GCF's to simplify a derivative
- Find rate of change problems
- Writing equations of lines using the derivative
- Use implicit differentiation to find the derivative of a function

**Core Activities:** Students will complete/participate in the following:

- Utilize the graphing calculator as an aid in finding the tangent line to a function at a point
- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Desmos → Related rates activity

**Extensions:**

- Work with more challenging problems
- Related Rates → See them 'em in action! video

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques



## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 5:** Applications of Differentiation

**Time frame:** 20 - 21 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Find extrema on an interval
- Determine where a function is increasing or decreasing
- Find inflection points
- Determine where a function is concave up or down
- Find limits as  $x$  approaches  $\pm\infty$
- Sketch a curve using the first and second derivative (without a graphing calculator)
- Use the Mean Value Theorem
- Use Rolle's theorem

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Group activity for curve sketching
- Analyze problems and do one of the following:
  - a. find the mistake
  - b. determine the next step
  - c. give a reason that includes mathematical terminology to explain a particular step in the problem

**Extensions:** Apply concepts to solve optimization problems

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators (scientific when curve sketching)

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 6:** Transcendental Functions and Their Derivatives

**Time frame:** 6 - 7 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Differentiate exponential functions
- Differentiate natural logarithm functions
- Find relative extrema and inflection points of natural logarithm functions
- Utilize properties of logarithms for logarithmic differentiation

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Group activity for curve sketching
- Analyze problems and do one of the following:
  - a. find the mistake
  - b. determine the next step
  - c. give a reason that includes mathematical terminology to explain a particular step in the problem

**Extensions:** Apply concepts to graph logarithmic functions

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators (scientific when graphing)

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

# Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 7:** Trigonometric Functions and Their Derivatives

**Time frame:** 6 - 7 Blocks

**Essential content/objectives:** At end of the unit, students will be able to

- Use the unit circle to calculate limits of trigonometric functions
- Utilize the two special trigonometric limits
- Differentiate all six trigonometric functions
- Use the derivative of trigonometric functions to find the slope at a point
- Use the chain rule to differentiate trigonometric functions
- Find relative extrema and inflection points of natural logarithm functions
- Utilize properties of logarithms for logarithmic differentiation

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Limits and derivatives circuit for trigonometric functions

**Extensions:** Apply concepts of calculus to show students how they graphed sine and cosine in pre-calculus

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators (scientific when graphing)

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 8:** Integration (to include transcendentals and trigonometric functions)

**Time frame:** 12 - 13 class periods

**Essential content/objectives:** At end of the unit, students will be able to

- Use basic integration rules to find the antiderivative for indefinite integrals
- Find a particular solution given an initial condition
- Use properties of integrals
- Find the area using geometric formulas
- Use the First Fundamental Theorem of Calculus for definite integrals
- Use integration to find the area under a curve
- Use Mean Value Theorem for integrals
- Use the Second Fundamental Theorem of Calculus
- Use integration to find the area under a curve
- Use U-substitution to aid in integration

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Integral Card Sort

**Extensions:**

- Explore the concept of Riemann sums
- Use the graphing calculator to graph area under a curve

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 9:** Application of Integration

**Time frame:** 7 - 8 class periods

**Essential content/objectives:** At end of the unit, students will be able to

- Find area between two curves
- Find volume using the Disc and Washer method

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Analyze problems and do one of the following:
  - a. find the mistake
  - b. determine the next step
  - c. give a reason that includes mathematical terminology to explain a particular step in the problem

**Extensions:** Find volume with known cross sections - GeoGebra

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques

## Curriculum Scope & Sequence

**Planned Course:** Honors Calculus

**Unit 10:** Separable Differential Equations and Partial Fractions

**Time frame:** 5 - 6 class periods

**Essential content/objectives:** At end of the unit, students will be able to

- Classify and verify the solution to a differential equation
- Separate a differential equation to find the particular solution
- Break a rational expression down into its partial fractions
- Use integration to integrate a rational expression

**Core Activities:** Students will complete/participate in the following:

- Complete examples of problems in class
- Participate in individual, pair, and small group practice of concepts
- Analyze problems and do one of the following:
  - a. find the mistake
  - b. determine the next step
  - c. give a reason that includes mathematical terminology to explain a particular step in the problem

**Extensions:** Euler's method

**Remediation:**

- Additional practice exercises
- Desmos or Kuta problems
- Chapter review exercises that revisit concepts and vocabulary
- Teacher / peer tutoring

**Instructional Methods:**

- Direct Instruction / Group Work / Individual Work
- Higher order thinking questions
- Warm ups
- Teacher directed examples

**Materials & Resources:**

- Textbook
- ThinkPad
- Notes and examples
- Handouts / worksheets
- Calculators

**Assessments:**

- Warm ups
- Teacher observations of student work
- Homework / assignments
- Quizzes / tests
- Questioning techniques