

Wilson Area School District Planned Course Guide

Title of planned course: AP Calculus AB

Subject Area: Math

Grade Level: 10-12

Course Description: This is a college-level course in differential and integral calculus, equivalent to one semester of calculus at most universities. Topics include a review of functions, an introduction to limits and continuity, derivatives and their applications, integrals and their applications, anti-derivatives and the Fundamental Theorem of Calculus, and an introduction to differential equations using slope fields. There is an emphasis on conceptual understanding and working with functions represented graphically, numerically, analytically, and verbally. The TI-84 graphing calculator is used extensively. The Advanced Placement Calculus AB exam is expected of all students in this course.

Time/Credit for this Course: 1 Academic Year / 1.0 Credit

Curriculum Writing Committee: Christal Vitko

Curriculum Map

August:

Function Review

September:

Limits and Continuity

October:

Derivatives

November:

Derivatives

December:

Applications of Derivatives

January:

Applications of Derivatives
Integration

February:

Integration

March:

Applications of Integration
Differential Equations and Slope Fields

April:

Differential Equations and Slope Fields
AP Exam Review

May:

AP Exam Review
Student Video Projects

June:

Student Video Projects

Wilson Area School District Planned Course Materials

Course Title: AP Calculus AB

Textbook:

1. Finney, Ross L., Franklin Demana, Bert Waits, and Daniel Kennedy.
Calculus: Graphical, Numerical, Algebraic. Reading, Mass.: Addison Wesley, 1999.

Supplemental Books:

1. Edwards, Bruce. and Larson, Ron. *Calculus of a Single Variable: Early Transcendental Functions*. Boston, Mass.: Brooks/Cole, Cengage Learning, 2011.
2. Rogawski, Jon. *Single Variable Calculus*. New York, NY.: W.H. Freeman and Company, 2008.
3. Foerster, Paul A. *Calculus: Concepts and Applications*. Emeryville, Cal.: Key Curriculum Press, 2005.

Teacher Resources:

1. Lederman, David and McMullin, Lin. *Multiple Choice and Free Response Questions in Preparation for the AP Calculus AB Examination*. Brooklyn, NY.: D & S Marketing, 2004.
2. Kelley, W. Michael. *Master the AP Calculus AB & BC Tests*. Lawrenceville, NJ.: Peterson's, 2003.
3. Teacher created handouts/activities
4. Internet Resources

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Function Review

Time frame: 5-6 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.8.11.B, 2.8.11.D, 2.8.11.F, 2.10.11.A, 2.10.11.B

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.D.2, M11.D.1, M11.C.1

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

- Graph/ Identify Linear, Quadratic, Cubic, Exponential, Logarithmic, Rational and Trigonometric functions.
- Write/Solve Linear, Quadratic, Cubic, Exponential, Logarithmic, Rational and Trigonometric functions.
- Identify the domain and range of a function using its graph or equation.
- Interpret and find formulas for piecewise functions.
- Evaluate compositions of functions.
- Graphing Calculator Review: How to graph and solve functions and how to adjust the viewing window.

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

- Review worksheets as a class
- Work in partners to discuss graded summer assignment

Extensions: “Date My Function” project

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, warm ups, notes in SMART Notebook, group and small group discussions

Materials & Resources: Textbook, Internet, Review Packets/Handouts, Graphing Calculators

Assessments: Teacher Observation, questioning, Summer Review Packet, and Review of Functions Test

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Limits and Continuity

Time frame: 15-20 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.5.11.B, 2.8.11.B, 2.8.11.D, 2.8.11.E

Anchor(s) or adopted anchor: M.11.A.1, M11.A.2, M11.A.3, M11.D.2, M11.D.1, M11.D.4

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

- Calculate the average and instantaneous rates of change
- Calculate limits using a graphing calculator and table.
- Calculate limits using the graph or the properties of a function.
- Calculate one-sided limits
- Determine when limits do not exist
- Calculate limits involving infinity and to determine vertical and horizontal asymptotes using limits involving infinity
- Use properties of limits and indeterminate forms.
- Determine discontinuities of a function and remove them if possible
- Apply the Intermediate Value Theorem
- Find a missing constant to make a piecewise function continuous
- Find the slope of a tangent line using the Difference Quotient

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

- Complete notes and practice problems in notes packets
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: “We Belong Together” Lab for functions, graphs, and limits; online tutorials with visuals; “I have...Who has” game for limits; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packet, quizzes and tests

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Derivatives

Time frame: 30-35 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.8.11.B, 2.8.11.D

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.D.2, M11.D.1

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

- Estimate and sketch derivatives given a table and a graph
- Determine the differentiability of a function
- Match graphs of functions with their derivatives
- Use the rules of differentiation (power, product, quotient, chain)
- Differentiate inverses of functions
- Differentiate six trig functions and the inverse trig functions
- Differentiate implicitly
- Differentiate exponential and logarithmic functions
- Calculate velocity and acceleration given position functions

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

- Complete notes and practice problems in notes packets
- Complete practice worksheets in class
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: “Hands-On Activity: Estimating Derivatives”; Exploration Activity 1 page 98 in textbook; “Go fish for derivatives” activity; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packets, quizzes and tests

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Applications of Derivatives

Time frame: 30-35 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.5.11.A, 2.5.11.B, 2.8.11.B, 2.8.11.D, 2.8.11.E, 2.8.11.F, 2.10.11.A, 2.11.11.A

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.D.2, M11.D.1, M11.D.4, M11.C.1

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

- Describe motion on a line using calculus
- Interpret motion given the graph of a function
- Determine the local or global extreme values of a function
- Apply the Mean Value Theorem and Rolle's Theorem
- Find the intervals in which a function is increasing/decreasing
- Find points of inflection and determine the concavity of a function using the second derivative
- Sketch a curve using calculus concepts
- Use the first and second derivative tests to justify max and mins
- Solve Optimization problems
- Find local linearizations
- Solve related rates problems

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

- Complete notes and practice problems in notes packets
- Complete practice worksheets in class
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: View motion on a line using the parametric mode on the graphing calculator; Challenge optimization problems; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packets, quizzes and tests

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Integration

Time frame: 20-25 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.3.11.C, 2.8.11.B, 2.8.11.D, 2.11.11.C

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.B.2.2, M11.D.2, M11.D.1

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

- Calculate the area under a curve using RAM and Trapezoids
- Calculate the area under a curve using geometric formulas
- Calculate the area under a curve using a graphing calculator
- Apply the properties of Integrals
- Find anti-derivatives of functions using u-substitution when necessary
- Apply the Fundamental Theorem of Calculus Parts 1 and 2
- Find the Average Value of a Function
- Interpret the area under a graph as a net accumulation of a rate of change.

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

- Complete notes and practice problems in notes packets
- Complete practice worksheets in class
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: Optional student projects; project in Excel to calculate area using RAM; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packets, quizzes and tests.

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Applications of Integration

Time frame: 12-17 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.3.11.C, 2.5.11.A, 2.5.11.B, 2.8.11.B, 2.8.11.D, 2.8.11.E, 2.8.11.F, 2.10.11.B, 2.11.11.C

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.B.2.2, M11.D.2, M11.D.1, M11.D.4

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

- Calculate the area between two curves
- Find the volume of solids with known cross-sections
- Find the volume of solids of rotation using the disk and washer method

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

- Complete notes and practice problems in notes packets
- Complete practice worksheets in class
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: Geometer's Sketchpad Activities; Optional student projects to construct solids; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packets, quizzes and tests.

Curriculum Scope & Sequence

Planned Course: AP Calculus AB

Unit: Differential Equations and Slope Fields

Time frame: 12-17 class periods

State Standards: 2.1.11.B, 2.1.11.F, 2.2.11.C, 2.5.11.A, 2.5.11.B, 2.8.11.B, 2.8.11.D, 2.8.11.E, 2.8.11.F, 2.11.11.B

Anchor(s) or adopted anchor: M11.A.1, M11.A.2, M11.A.3, M11.D.2, M11.D.1, M11.D.4

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

- Interpret the integral of a rate as a net change
- Determine displacement and total distance traveled
- Solve differential equations including those involving position, velocity, and acceleration
- Solve problems involving exponential growth and decay
- Create and interpret slope fields
- Match slope fields with their differential equations

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

- Complete notes and practice problems in notes packets
- Complete practice worksheets in class
- Investigate topics using a graphing calculator
- Review assignments as a class
- Participate in class discussion on topics

Extensions: Optional student projects; Released AP Free Response Questions

Remediation: Math Lab, appointments with teacher, calculus videos online

Instructional Methods: Lecture, notes in SMART Notebook, group and small group discussions

Materials & Resources: SMART Board, Pre-Written notes/handouts/activities, Textbook, Internet, Graphing Calculators

Assessments: Teacher observation, homework, questioning, review packets, quizzes and tests