Calculus A

Teacher: Mr. Sprenger (msprenger@scappoose.k12.or.us)

Weebly: http://sprengermath.weebly.com/

Prerequisite: Passed Pre-Calculus A and B

Supplies: Each day, you need to bring: a pencil, paper, graph paper, and a graphing calculator.

Homework:
Your responsibility is to attempt all problems, SHOWING ALL WORK. Corrections will be made during class. A score ranging from 0 to 10 will be given depending upon amount of homework completed.

Quizzes:
Quizzes will be given for each section covered. All quizzes are worth 30 points. Quizzes can cover any material previously learned.

Exams:
Individual tests will be given each chapter. Each test is worth 100 points.

Final Exam:
The final exam will cover the entire semester and will be worth 100 points.

Grading: Grades will be determined by the following and there will be no rounding of grades.

A – 90% and above	Homework or Projects - - - 10%
B – 80% - 89%	Quizzes - - - 20%
C – 70% - 79%	Unit Tests - - - 50%
D – 60% - 69%	Final Exam - - - 20%
F – below 60%	

Hall Passes: If you do not have a hall pass, then you are not leaving – DON'T ASK!!!

Tardies: All tardies will be 1 minute after class.

Rules: Follow directions immediately. Work during all work times. Keep hands, feet, and objects to yourself. Arrive on time with all materials (pencil, notebook, and a calculator). Music, food, and cell phones are not allowed.

AP Calculus AB Syllabus

Course Overview

This course is designed to train students to think logically. They will have to solve problems step-by-step with explanatory sentences, not just a bunch of disconnected equations or formulas. The course will emphasize the ability to problem-solve in a variety of ways – graphically, numerically, analytically, and verbally. Students will have to use graphing calculators to help find solutions, interpret results, and support conclusions. Students will learn to appreciate the learning process, through thought provoking problems which challenge their intellect at all levels.

Trimester 1 – AP Calculus A

Chapter 1 – Functions and Models

-Four Ways to Represent a Function
  *Verbally, Numerically, Visually, Algebraically
-New Functions from Old Functions
  *Constant, Power, Root, Polynomials, Algebraic, Trigonometric
  *Vertical and Horizontal Shifts
  *Vertical and Horizontal Stretching
  *Algebra of Functions
  *Composite Functions
  *Odd vs Even
-Graphing Calculators
  *Changing the Viewing Window
-Parametric Curves   -   -   -   -   LAB (Families of Hypocycloids)
  *Graphing
  *Eliminating Parameters
-Exponential Functions
  *Applications
-Inverse and Logarithmic Functions
  *Applications
  *One-to-One

Chapter 2 – Limits and Derivatives

-Tangent and Velocity
  *Finding Slope and Equations of Tangents with Limits
  *Finding the Velocity of an Object with Limits
-Limits of a Function
  *Basic Limits by Approximation
  *Right and Left Hand Limits

-Limits Using the Limit Laws
  *11 Limit Laws
  *Squeeze Theorem
-Continuity
  *Continuous vs Discontinuous
  *3 Steps to Determine Continuity
  *Continuous on a Closed Interval
  *Intermediate Value Theorem
-Limits Involving Infinity
  *Vertical and Horizontal Asymptotes
-Tangents, Velocities, and Rates of Change
  *Tangent Lines
  *Instantaneous Velocity vs Average Velocity
  *Change in Temperature, Rate of Reaction, Marginal Cost, and Population
   Growth
-Derivatives -   -   -   -   LAB (Early Methods for Finding Tangents)
  *Introduction to Derivatives
  *Derivative as the Slope of a Tangent
  *Derivative as a Rate of Change
-Derivatives as a Function
  *7 Different Notations for a Derivative
  *How Can a Function not be Differentiable
  *Second Derivative and its Notation
-What does f' say about f?   What does f'' say about f?
  *Increasing vs Decreasing
  *Local Maximum and Minimums
  *Concave Up and Down
  *Points of Inflection

Chapter 3 – Differentiation Rules

-Derivatives of Polynomials and Exponential Functions
-Product and Quotient Rule
-Rates of Change in Natural and Social Science
  *Physics, Chemistry, Biology, Economics, Geology, Psychology, and Sociology
-Derivatives of Trigonometric Functions
-Chain Rule   -   -   -   -   LAB (Bezier Curves or Pilots Descent)
  *Derivatives of Parametric Curves
-Implicit Differentiation
  *Orthogonal
  *Derivatives of Inverse Trigonometric Functions
-Derivatives of Logarithmic Functions

Trimester 2 – AP Calculus B

Chapter 4 – Applications of Differentiation

-Related Rates
        *Problem Solving Strategies
-Maximum and Minimum Values   -   -   -   LAB (Calculus of Rainbows)
        *Absolute vs Local Maximum and Minimum Values
        *Extreme Value Theorem
        *Critical Numbers
        *Closed Interval Method
-Derivatives and the Shapes of Curves
        *Increasing vs Decreasing
        *Concavity
-Graphing with Calculus and Calculators
        *Graphical Analysis
-Indeterminate Forms and L'Hospital's Rule
        *Writing Project - - - Origin of L'Hospital's Rule
-Optimization Problems
        *6 steps to Optimization
        *Real-World Applications
-Application to Economics
-Newton's Method

Chapter 5 – Integrals

-Area and Distances
        *Approximations Using Rectangles
        *Riemann Sums (Right, Left, Midpoint, and Sample Points)
-Definite Integrals
        *Integrand, Integral Sign, Limits of Integration
        *Properties of Integrals
-Evaluating Definite Integrals
        *Evaluation Theorem
        *Indefinite Integral Table
        *Applications to Integrals
-Fundamental Theorem of Calculus
        *How Does an Integral Relate to a Derivative
-Substitution Method
        *Integral of Symmetric Functions
-Integration by Parts
-Integration Using Technology   -   -   -   LAB (Patterns in Integrals)

Chapter 6 – Applications of Integration

-More on Area
        *Area Between Curves
        *Area Enclosed by Parametric Equations
-Volume
        *Cross-Sections
-Arc Length
        *Functions
        *Parametric Equations
-Average Value of a Function   -   -   LAB (Where to Sit at the Movie)
        *Mean Value Theorem for Integrals
-Applications to Physics and Engineering
        *Work
        *Hooke's Law
        *Hydrostatic Pressure and Force
-Application to Biology
        *Cardiac Output

Chapter 7 – Differential Equations

-Modeling with Differential Equations
        *Population Growth
        *Motion of a Spring
        *Initial Condition
-Slope Fields
-Separable Equations
        *Mixing Problems

Teaching Strategies

As a teacher, I find it very important for students to truly understand the concepts.
Mathematics is not about memorizing formulas or theorems, but understanding how to
apply them to problems. Students will have to solve many problems in many different
ways – graphically, numerically, analytically, and verbally. Students are often asked to
demonstrate their understanding to their peers. Teaching or explaining one's conceptual
understanding will allow the material to be stored into their long term memory. I do not
believe in lecturing for an extensive period of time. I believe students learn by doing.
Students will learn through the use of technology, discovery, and most importantly they
will learn from each other. Discussing mathematics will become an everyday event for
students.

Student Evaluation

Students are evaluated on their ability to problem solve. Correct answers are not the most important aspect of calculus; the process of getting to the correct answer is more important. Students will be given a short quiz on each section learned. Students will feel comfortable with the assessment process. They will have multiple opportunities to demonstrate their abilities. A unit exam will also be given following each chapter. The chapter tests are cumulative, thus providing students with a constant review of previous topics. Some parts of the tests will be taken without a calculator. This will enable students to become comfortable solving problems without the calculator. Each unit test will also contain one of the AP free-response questions and a few multiple choice questions. The goal is for students to feel confident in their abilities when taking the AP exam. The questions will not seem any harder than what they have been expected to do in class.

Teaching Resources

Primary Textbook

Stewart, James. Calculus – Concepts and Contexts. New York: Brooks/Cole Co., 1998.

References

Larson, Hostetler, and Edwards. Calculus – with Analytic Geometry 7th ed. Boston: Houghton Mifflin Co., 2002.

AP Calculus – 2006-2007 Professional Development Workshop Materials

Technology Resources

Smart Board – Smart Technologies

TI Emulator – Graphing calculator that works with the smartboard.

AP Central Website – www.apcentral.collegeboard.com

Weeks, Audrey. Calculus in Motion, CD-ROM. Burbank, Calif.: Calculus in Motion 2005. This CD has great calculus animations for Geometer's Sketchpad v4. www.calculusinmotion.com