**Course: AP Calculus AB/BC Teacher: Keith Meyer**

**Email:** Keith.Meyer@bisd.net

**Room:** A-14

**Conference:** 8th period 3:02 – 3:50

**Tutorials:** Normally each morning at 7:40 and Monday, Tuesday, and Friday afternoons starting at 4:00.

**Pre-Advanced Placement and Advanced Placement Courses**

Minor Grades-25% Major Grades-75%

*Examples* of minor grades may include, but are not limited to, the following: homework, weekly notebook checks, pop quizzes, warm-ups, worksheets, vocabulary, short essays, short presentations, cooperative learning group work, mini-assessments, etc. Minor grades are primarily based on the student’s practice of academic skills.

*Examples* of major grades may include, but are not limited to, the following: projects, major papers, major tests, presentations, labs, unit tests, unit projects, 9 week tests, notebooks, etc. Major grades measure a student’s academic achievement.

**Progress Reports** will be issued every three weeks to every student. On level courses will provide a minimum of 9 minor and 3 major grades in any 9-week grading period. Pre-AP and AP courses will provide a minimum of 6 minor and 3 major grades in a 9-week grading period.

**Retakes & Re-dos of Assignments**

Students will be allowed to redo an assignment or retake an examination for which the student originally made a failing grade up to five days after the grade has been posted.

**Make-Up Work due to Absences**

Students will receive the number of days the student was absent to complete and submit make-up work.

**Calculators:** A class set of TI-84 calculators is available for student use each day. However, students may use any personal calculator that they may own. The suggested calculators for this class are the TI-84 and the TI-89.

**Guidelines for Success:**

*PRIDE: be Positive, be Respectful & Responsible, be Involved, be Determined, be Ethical*

**Objective and Goals of the class:**

The objective of calculus BC is to provide students an appreciation of mathematics beyond rote memorization. This course strives to accomplish the following goals to each student willing to put in the necessary time and effort.

1. To teach all topics associated with Functions, Graphs, and Limits; Derivatives; and Integrals as delineated in the Calculus BC Topic Outline in the AP Calculus Course Descriptions
2. To provide students with the opportunity to work with functions represented in a variety of ways (graphically, numerically, analytically, and verbally) emphasizing the connections among each of these representations.
3. To teach students how to communicate mathematics by explaining solutions both verbally and in writing.
4. To be thoroughly comfortable with using the graphing calculator when necessary to solve problems, experiment, interpret results and support conclusions.

5. To reinforce prior math knowledge by using skills taught in earlier math classes.

6. To be challenged to a higher thinking level by writing in complete sentences reasons for conclusions.

7. To establish calculus concepts that will be used in other subjects (engineering and business)

 8. To be adequately prepared for success (3 or above) on the AP test.

**Timeline**

**Pre-Calculus Review**

Most of the students that elect to enroll in the BC calculus class generally do not need to have a systematic review period. Review of pre-cal concepts will be handled at the time needed. However, graphing calculator skills will be discussed and reviewed.

*Students will be required to demonstrate that they have acquired the graphing calculator skills that are necessary for discovery and solving problems. Students will be asked to graph several different functions and use their calculator to make conjectures about different transformations. During this time different techniques such as storing answers, using tables, zoom-in procedures etc. will be reviewed* *to avoid teaching these skills when learning calculus concepts*

**Limits and continuity (~7 days**)

Topics covered below are usually in this order. Major tests will be given periodically during this time. Several questions, multiple choice and free response, modeled after previous AP problems will be included.

**Topics**

 1. Finding limits by tables and graphs

 2. Properties and methods used to evaluate limits

 3. Definition of continuity and determining if a function is continuous

 4. Behavior and characteristics of vertical and horizontal asymptotes

 5. Finding infinite limits and limits approaching infinity

*Students will be tested and given assignments that determine if they will be able to solve problems by more than one method. During the discussion of limits students will be required to confirm their analytical solutions graphically and vice versa. Students will use the calculator table feature as they investigate limits as they approach a value from both directions. These techniques will then be used to support the conclusions drawn from analytical methods of finding the limits.*

**Derivatives (~15 days)**

Extra days are built into this time period to allow for ability level of each class. Practice AP problems, multiple choice and free response questions are given during this time period. Several major tests will be administered periodically.

**Topics**

 1. Defining the derivative using the difference quotient

 2. Using the difference quotient to find the equation of the tangent lines

 3. Explanation of when derivatives do not exist

 4. Simple differentiation rules

 5. Using derivatives in velocity and acceleration problems

 6. The product and quotient rules

 7. The chain rule

 8. Implicit differentiation

 9. Related rate problems

*Students will confirm the tangent line of a function using the graphing calculator, by graphing the tangent line equation that was derived as well as the function on the same graph.*

*Students will use their calculator to simulate motion parametrically and will confirm the conclusion found by analytical methods (i.e. time when particle changes directions, intervals the particle moves right, left etc.). The* Calculus in Motion *program will be use to visualize different related rate problems. During this unit students should be prepared to explain and demonstrate their solution to different problems to the class by writing the solution on the board.*

**Applications to derivatives (~15 days)**

Many of the application problems will model AP problems. Emphasis is on the concepts however to ensure that the students can solve a variety of problems

**Topics**

 1. Define extremas, critical points and maximum/minimum problems

 2. Rolles theorem and mean value theorem

 3. Using the 1st and 2nd derivative tests

 4. Discussion of the optimization problems

 5. Linearization and differentials including business application

*Students will be required to use graphs as well as analytical methods to confirm conclusions. At this time students will also need to state verbally reasons to back their assessments when called upon. Using the calculator students will graph the first and second derivatives as well as the original function on the same graph to develop conjectures about the relationship of these three graphs. They will be given an activity, to be work in groups of two or three, matching graphs of functions, the first and second derivatives. They will be asked to explain the method used to group the graphs. The use of the calculator to solve problems will be required often during this unit.*

**Second Nine Weeks**

 **Anti-derivatives (~5 days)**

Simple integration rules and solving simple differential equations will be taught. Also, during this period there will be a discussion of slopefields and Euler’s method with several examples of slopefields from past AP tests. A major test will be given at the end of this unit.

**Topics**

 1. General anti-derivatives using simple integration formulas

 2. Solving simple differentiation equations

*Each person will be given a different point from a given differential equation and will be required to calculate the slope and then sketch a small portion of the line on the graph displayed in the front of the room. This will allow us to graph the slopefield very quickly. These will be confirmed with calculator based applications that graph slopefield*s. *Students will be then be given the opportunity to graph individual slopefields using small 3x3 graphs.*

**Integration (~9 days)**

Connecting differential calculus to integral calculus will be a major goal of this unit. Students will be given examples using a variety of different techniques used in solving these problems. A major test will be included in this section

**Topics**

 1. Area and Riemann sums

 2. Accumulation of a rate of change

 3. Rectangular approximation methods

 4. Trapezoid and Simpson’s rule

 5. Fundamental theorems of calculus

 6. Evaluating integrals using substitutions

*Students will have the opportunity to use the different accumulating techniques to solve a variety of problems. They will show the graphs of a given function with the rectangles drawn representing either right RAM, left RAM or middle RAM. The area for each will be calculated with the calculations shown on their paper. Then each graph will be displayed in the classroom. We will use the calculator and the* Calculus in Motion *program to demonstrate the estimation of area as the number of rectangles gets larger.*

**Natural Logs and exponential functions (~25 days)**

 After a brief review of logs, students will develop the derivatives and integrals of the exponential and natural log functions. A considerable amount of time will be given to application of the exponential functions such as growth and decay and other rate of growth functions. A couple of major tests will be included in this section.

**Topics**

 1. Review of logarithms and inverse functions

 1. Derivative and integral of natural logs

 2. Derivative and integral of exponential functions

 3. Finding derivative and integral of bases other than e

 4. Growth and decay applications including logistic curves

 5. Inverse trig functions

 6. Derivatives and integrals of inverse trig function

 7. Logistic Growth

8. Slope fields and Euler’s method

*The graphing calculator will be used to verify concepts discussed during this unit. An experiment using mm’s can be used to demonstrate exponential growth. Students will work in groups of two or three in order to discuss the activity with each other.*

**Area and volume (~9 days)**

Students will use the connection of integral to area and volume problems. A major test will be given as well as several quizzes. Sometimes this unit will need to be postponed until the third nine weeks if students needed more time on the other concepts.

**Topics**

 1. Area between curves

 2. Volume by the disc, washer, and shell method

 3. Finding volume by cross-sectional areas

 4. Arc length

*Using party supplies helps students visualize the rotation of functions around the x and y axis.*

*The use of* Calculus in Motion *also will be used to help visualize the concepts of volume by rotation and cross-sectional areas. The built in features of the calculator will be used to calculate volumes. However, students will be required to know how to solve volumes by analytical methods.*

**Semester Review and Test**

This test will cover the entire year so far. The test will have multiple choice, free response, calculator and non calculator sections modeled after the AP test.

*As an extra credit project students will have the opportunity to make up words to different Christmas songs using calculus terms learned thus far. Students will perform this in front of the class.*

**Third Nine Weeks**

**BC Topics**

The next part of the course consists of primarily BC topics. However, flexibility is needed in the course timeline as some of these topics can be included in first semester. Sometime during this semester an AP released AB test is given. This gives the students practice taking an AP test and reviews AB content

**Advanced Integration Techniques (~14 days**)

Other methods of integration will be covered in this unit. Emphasis will be given to partial fractions, integration by parts and improper integrals. Trig integral will be moderately discussed. A major test will be given primarily over the different techniques covered.

**Topics**

 1. Basic integration techniques

 2. Integration by parts

 3. Trigonometric integrals and integration by trig substitution

 4 Integration by partial fractions

 5. L’hopital’s rule

 6. Improper integrals

**Infinite series (~25 days)**

Pace during this unit varies and should not be rushed. Enough practice should be given for the students to understand the concepts. Usually three major tests are administered during this unit as well as a variety of past AP problems.

**Topics**

 1. Sequences

 2. Infinite and geometric series

 3. Tests of convergence

 A. nth term test B. geometric series C. integral test

 D. p- test E. direct comparison test F. limit comparison test

 G. ratio and root test H. alternating series test I. alternating series remainder

 4. Taylor and Maclaurin polynomials

 5. Power series

 6. Taylor and Maclaurin series

 7. Lagrange Error

**Fourth nine weeks**

**Parametric and Polar equations (~10 days)**

This unit can be covered later in the year. Usually two major tests are given. Many of the problems given are from past AP tests.

**Topics**

 1. Parametric equations and graphs

 2. Finding derivatives and arc length of parametric equations

 3. Vectors

 4. Polar coordinates and polar graphs

 5. Area and arc length of polar graphs

*Students will be required to use their graphing calculator to investigate the direction of the curves given in parametric mode. Also, the built in functions of the calculator will be used to determine the area of pedals, inner/outer loops, etc.*

**Review for AP test (14 days**)

 Time is built into the year to do an intensive review for the AP test. Practice multiple choice and free response problems will be given. If time permits, a full released BC test will also be given.