YOSEMITE HIGH SCHOOL
50200 ROAD 427 - OAKHURST, CA 93644
(559)683-4667

COURSE TITLE: *MATH ANALYSIS*
DEPARTMENT: *MATHEMATICS*

REQUIREMENT SATISFIED:			
High School:	*X*	*Model Curriculum Standards:*	*X*
State College:	*X*	*Frameworks:*	*X*
UC Approved:	*X*		

GRADE LEVEL: *9-12* *LENGTH OF COURSE: 1 YEAR* *CREDITS: 10*

PREREQUISITE: *Successful completion of Algebra 1, Geometry, Algebra 2 or Algebra 2/Trigonometry, and teacher recommendation.*

TEXTBOOKS: *PreCalculus with Limits: A Graphing Approach, 3rd Ed., Larson, Hostetler, Edwards*

COURSE DESCRIPTION:

Math Analysis is primarily a course in Trigonometry and other topics to prepare students for Calculus. Problem solving is emphasized throughout the course. Content includes trigonometric and circular functions and their applications and properties, composition of ordinates, rotary motion, inverse functions, law of sines, law of cosines, area of triangles, vectors, polar coordinates and Cartesian conversion, complex numbers, probability and statistics, limits, and an introduction to Calculus. The Math Analysis course will give students the background needed to facilitate a smooth transition to college-level Calculus.

Math Analysis draws from six different areas within the California Mathematics Academic Content Standards: Trigonometry (T), Mathematical Analysis (MA), Probability and Statistics (PS), Linear Algebra (LA), Algebra 2 (A),and Calculus (C)

COURSE OUTLINE/ALIGNMENT TO CALIFORNIA STATE STANDARDS AND EXPECTED SCHOOLWIDE LEARNING RESULTS:

Chapter/ Text	*Assignment Course Content/Objective*	*Standards Addressed*	*ESLRs*
4.1	*Radian and degree measure*	*T1*	*1,2,3,4,6*
4.2	*Trigonometric functions: The unit circle*	*T2*	*1,2,3,4,6*
4.3	*Right triangle trigonometry*	*T3*	*1,2,3,4,6*
4.4	*Trigonometric functions of any angle*	*T2*	*1,2,3,4,6*
4.5	*Graphs of sine and cosine functions*	*T4*	*1,2,3,4,6*
4.6	*Graphs of other trigonometric functions*	*T5,T6*	*1,2,3,4,6*
4.7	*Inverse trigonometric functions*	*T8,T9*	*1,2,3,4,6*
4.8	*Applications and models*	*T12,T19*	*1,2,3,4,6*
5.1	*Using fundamental identities*	*T3*	*1,2,3,4,6*
5.2	*Verifying trigonometric identities*	*T3*	*1,2,3,4,6*
5.3	*Solving trigonometric equations*		
5.4	*Sum and difference formulas*	*T10*	*1,2,3,4,6*
5.5	*Multiple-angle and product-sum formulas*	*T11*	*1,2,3,4,6*
6.1	*Law of sines*	*T13*	*1,2,3,4,6*
6.2	*Law of cosines*	*T13*	*1,2,3,4,6*
6.3	*Vectors in the plane*	*MA1*	*1,2,3,4,6*
6.4	*Vectors and dot products*	*LA12*	*1,2,3,4,6*
6.5	*Trigonometric form of a complex number*	*MA2*	*1,2,3,4,6*

9.6	*Counting principles*	*A18*	*1,2,3,4,6*
9.7	*Probability*	*PS1,2,3*	*1,2,3,4,6*
	Probability topics covered by additional resources		*1,2,3,4,6*
	Statistics topics covered by Appendix B1, B2, additional resources	*PS6,7,8*	*1,2,3,4,6*
1.1	*Functions*		*1,2,3,4,6*
1.2	*Graphs of functions*	*A10*	*1,2,3,4,6*
1.3	*Shifting, reflecting, and stretching graphs*	*A9*	*1,2,3,4,6*
1.4	*Combinations of functions*		*1,2,3,4,6*
1.5	*Inverse functions*	*A24*	*1,2,3,4,6*
2.3	*Real zeros of polynomial functions*	*MA4*	*1,2,3,4,6*
2.6	*Rational functions and asymptotes*	*MA6*	*1,2,3,4,6*
2.7	*Graphs of rational functions*	*MA6*	*1,2,3,4,6*
3.1	*Exponential functions and their graphs*		*1,2,3,4,6*
3.2	*Logarithmic functions and their graphs*	*A11,14*	*1,2,3,4,6*
3.3	*Properties of logarithms*	*A13,14*	*1,2,3,4,6*
3.4	*Solving exponential and logarithmic functions*		*1,2,3,4,6*
10.5	*Parametric equations*	*MA7*	*1,2,3,4,6*
10.6	*Polar coordinates*	*T15,16 MA1*	*1,2,3,4,6*
12.1	*Introduction to limits*	*MA8,C1*	*1,2,3,4,6*
12.2	*Techniques for evaluating limits*	*MA8*	*1,2,3,4,6*
12.3	*The tangent line problem*	*C4.1*	*1,2,3,4,6*
12.4	*Limits at infinity and limits of sequences*	*C1*	*1,2,3,4,6*
12.5	*The area problem*		*1,2,3,4,6*

DISTRICT/STATE CONTENT STANDARDS ADDRESSED:

Trigonometry:

1. *Students understand the notion of angle and how to measure it, in both degrees and radians. They can convert between degrees and radians.*

2. *Students know the definition of sine and cosine as y- and x-coordinates of points on a unit circle and are familiar with the graphs of the sine and cosine functions.*

3. *Students know the identity* $\cos^2(x)+\sin^2(x)=1$.

   3.1: Students prove that this identity is equivalent to the Pythagorean theorem (i.e., students can prove this identity by using the Pythagorean theorem and, conversely, they can prove the Pythagorean theorem as a consequence of this identity).

   3.2: Students prove other trigonometric identities and simplify others by using the identity $\cos^2(x)+\sin^2(x)=1$. *For example, students use this identity to prove that* $\sec^2(x)=\tan^2(x)+1$.

4. *Students graph functions of the form f(t)=Asin(Bt+C) or f(t)=Acos(Bt+C) and interpret A,B, and C in terms of amplitude, frequency, period, and phase shift.*

5. *Students know the definitions of the tangent and cotangent functions and can graph them.*

6. *Students know the definitions of the secant and cosecant functions and can graph them.*

8. *Students know the definitions of the inverse trigonometric functions and can graph them.*

9. *Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.*

10. *Students demonstrate an understanding of the addition formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities.*

11. *Students demonstrate an understanding of half-angle and double-angle formulas for sines and cosines and can use those formulas to prove and/or simplify other trigonometric identities.*

12. *Students use trigonometry to determine unknown sides or angles in right triangles.*

13. *Students know the law of sines and the law of cosines and apply those laws to solve problems.*

15. *Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates and vice versa.*

16. *Students represent equations given in rectangular coordinates in terms of polar coordinates.*

Math Analysis:

1. *Students are familiar with, and can apply, polar coordinates and vectors in the plane. In particular, they can translate between polar and rectangular coordinates and can interpret polar coordinates and vectors graphically.*

2. *Students are adept at the arithmetic of complex numbers. They can use the trigonometric form of complex numbers and understand that a function of a complex variable can be viewed as a function of two real variables. They know the proof of DeMoivre's theorem.*

4. *Students know the statement of, and can apply, the fundamental theorem of algebra.*

6. *Students find the roots and poles of a rational function and can graph the function and locate its asymptotes.*

7. *Students demonstrate an understanding of functions and equations defined parametrically and can graph them.*

8. *Students are familiar with the notion of the limit of a sequence and the limit of a function as the independent variable approaches a number or infinity. They determine whether certain sequences converge or diverge.*

Linear Algebra:

12. *Students compute the scalar (dot) product of two vectors in n-dimensional space and know that perpendicular vectors have zero dot product.*

Algebra 2:

9. Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as a, b, and c vary in the equation $a(x-b)^2+c$.

10. Students graph quadratic functions and determine the maxima, minima, and zeros of a function.

11. Students prove simple laws of logarithms.

11.1: Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

13. Students use the definition of logarithms to translate between logarithms in any base.

14. Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.

18. Students use fundamental counting principles to compute combinations and permutations.

24. Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations of functions.

Probability and Statistics:

1. Students know the definition of the notion of independent events and can use the rules for addition, multiplication, and complementation to solve for probabilities of particular events in finite sample spaces.

2. Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.

3. Students demonstrate an understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes, such as the probability of the occurrence of five heads in 14 coin tosses.

6. Students know the definitions of the mean, median, and mode of a distribution of data and can compute each in particular situations.

7. Students compute the variance and the standard deviation of a distribution of data.

8. Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.

Calculus:

1. Students demonstrate knowledge of both the formal definition and the graphical interpretation of limit of values of functions. This knowledge includes one-sided limits, infinite limits, and limits at infinity. Students know the definition of convergence and divergence of a function as the domain variable of a function as the domain variable approaches either a number or infinity.

1.1: Students prove and use theorems evaluating the limits of sums, products, quotients, and composition of functions.

1.2: Students use graphical calculators to verify and estimate limits.

4.1: Students demonstrate an understanding of derivative of a function as the slope of the tangent line to the graph of the function.

OUTCOMES:

Students will demonstrate basic competency in the Math Analysis curriculum by achieving a minimum 70% proficiency in coursework.

INSTRUCTIONAL STRATEGIES:

Direct instruction
Group work
Individual instruction
Peer tutoring
Class projects

ASSESSMENT:

Teacher prepared tests and quizzes
Department-wide benchmark assessments including unit, mid-term, and final exams
Review of student work samples including class work and homework.
Student demonstrations
Class Projects
Other informal assessments

1/86
Revised: 12/89; 1/91; 1/98; 4/98; 8/03; 1/04