Math Analysis and Trigonometry

Course Overview:
This is a rigorous course designed to complete a year-long Math Analysis/Trigonometry class during our five-week summer school. Thus, the students are taught at an accelerated pace and should expect to have a minimum of one hour of homework each night. In order to be successful in this course, students need a strong background in Algebra II and a consistent work ethic. Be aware that the course is not an introduction to Math Analysis/Trigonometry. If the student needs to complete just one semester of this course, you may register for just that one semester. However, there is no fee reduction. Also, if the student only needs to take the second semester, we recommend that your child attend the first semester as well to help prepare them for the second.

Course Description:
Math Analysis/Trigonometry is a wonderful course that more deeply explores and builds upon the topics learned in Geometry and Algebra II. This course is meant to be equivalent to a Pre-Calculus course in that it will provide an adequate foundation for a future course in Calculus. This summer course is meant to provide a low-pressure environment where individual attention by the teacher and personal reflection by the student is highly promoted. The volume of content to be learned will be intense and daunting (a full year’s topics in five weeks). It is therefore the students' responsibility to ask “well thought-out” questions, complete assignments, and seek tutoring, if need be.

Course Goals and Objectives

Correlates with the California Common Core State Standards

Math Analysis:

1.0 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.

2.0 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.

3.0 Students can give proofs of various formulas by using the technique of mathematical induction.

4.0 Students know the statement of, and can apply, the fundamental theorem of algebra.
5.0 Students are familiar with conic sections, both analytically and geometrically:

5.1 Students can take a quadratic equation in two variables; put it in standard form by completing the square and using rotations and translations, if necessary; determine what type of conic section the equation represents; and determine its geometric components (foci, asymptotes, and so forth).

5.2 Students can take a geometric description of a conic section - for example, the locus of points whose sum of its distances from (1, 0) and (-1, 0) is 6 - and derive a quadratic equation representing it.

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

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

8.0 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.

Trigonometry:

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

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

3.0 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 \( \sec^2(x) = \tan^2(x) + 1 \).

4.0 Students graph functions of the form \( f(t) = A \sin(Bt + C) \) or \( f(t) = A \cos(Bt + C) \) and interpret \( A, B, \) and \( C \) in terms of amplitude, frequency, period, and phase shift.

5.0 Students know the definitions of the tangent and cotangent functions and can graph them.
6.0 Students know the definitions of the secant and cosecant functions and can graph them.

7.0 Students know that the tangent of the angle that a line makes with the x-axis is equal to the slope of the line.

8.0 Students know the definitions of the inverse trigonometric functions and can graph the functions.

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

10.0 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.

11.0 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.

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

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

14.0 Students determine the area of a triangle, given one angle and the two adjacent sides.

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

16.0 Students represent equations given in rectangular coordinates in terms of polar coordinates.

19.0 Students are adept at using trigonometry in a variety of applications and word problems.
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<th>Math Analysis</th>
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<td><strong>Week 1</strong></td>
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**Day 1 - FUNCTIONS AND THEIR GRAPHS**
- Salutations and first day chores
- Diagnostic test
- Functions
- Graphs of Functions
- Shifting, Reflecting, and Stretching Graphs
- Combinations of Functions
- Inverse Functions

**Day 2 - POLYNOMIAL AND RATIONAL FUNCTIONS**
- Homework Questions
- Quadratic Functions
- Polynomial Functions of Higher Degree
- Real Zeros of Polynomial Functions

**Day 3 - POLYNOMIAL AND RATIONAL FUNCTIONS**
- Homework Questions
- Fundamental Theorem of Algebra
- Rational Functions and Asymptotes
- Graphs of Rational Functions
- Extra Credit Questions

**Day 4 - EXPONENTIAL AND LOGARITHMIC FUNCTIONS**
- Homework Questions
- Exponential Functions and Their Graphs
- Logarithmic Functions and Their Graphs
- Further Exploration of Exponential and Logarithmic
- Test for Chapter One and Chapter Two

**Week 4**

**Day 13 - TRIGONOMETRIC FUNCTIONS**
- Post-Midterm Questions
- Radian and Degree Measure
- Trigonometric Functions: The Unit Circle
- Right Triangle Trigonometry

**Day 14 - TRIGONOMETRIC FUNCTIONS**
- Homework Questions
- Trigonometric Functions of Any Angle
- Graphs of Sine and Cosine Curves
- Graphs of Other Trigonometric Functions

**Day 15 - TRIGONOMETRIC FUNCTIONS**
- Homework Questions
- Inverse Trigonometric Functions
- Applications and Models
- Extra Credit Questions

**Day 16 - ANALYTIC TRIGONOMETRY**
- Homework Questions
- Using Fundamental Identities
- Verifying Trigonometric Identities
- Test on Chapter One

**Day 17 - ANALYTIC TRIGONOMETRY**
- Homework Questions
- Solving Trigonometric Equations
- Sum and Difference Formulas
- Extra Credit Questions

**Day 18 - ANALYTIC TRIGONOMETRY**
- Homework Questions
| Day 5- EXPONENTIAL AND LOGARITHMIC FUNCTIONS | ● Homework Questions  
● Properties of Logarithms  
● Solving Exponential and Logarithmic Equations  
● Exponential and Logarithmic Models  
● Extra Credit Questions  
| Day 19- ADDITIONAL TOPICS IN TRIGONOMETRY | ● Multiple Angle and Product-Sum Formulas  
● 2.3 to 2.4 Review  
● Extra Credit Questions  
|  
| Week 2  
Day 6 - Independence Day Holiday  
Day 7- SEQUENCES & SERIES | ● Homework Questions  
● Arithmetic Sequences and Series  
● Geometric Sequences and Series  
● Mathematical Induction  
● Extra Credit Questions  
|  
| Day 20- TOPICS IN ANALYTIC GEOMETRY | ● Homework Questions  
● Intro to Conics: Parabolas  
● Ellipses  
● Hyperbolas  
● Test on Chapters One, Two and Three  
|  
| Week 5  
Day 21- TOPICS IN ANALYTIC GEOMETRY | ● Homework Questions  
● Parametric Equations  
● Polar Coordinates  
● Graphs of Polar Equations  
● Extra Credit Questions  
|  
| Day 10- LIMITS AND AN INTRO TO CALCULUS | ● Homework Questions  
● Introduction to Limits  
● Techniques for Evaluating Limits  
● The Tangent Line Problem  
● Test for Chapter Three and Chapter Four  
| Day 22- TOPICS IN ANALYTIC GEOMETRY | ● Homework Questions  
● Rotation and Systems of Quadratic Equations  
● Polar Equations of Conics  
● The Tangent Line Problem  
● Introduction To The Derivative  
|  
| Day 23- Final Exam Review | ● Homework Questions  
● Chapter 1 Review  
● Chapter 2 Review  
|  
| Day 8- SEQUENCES & SERIES | ● Homework Questions  
● The Binominal Theorem  
● Counting Principals  
● Probability  
● Extra Credit Questions  
|  
| Day 9- LIMITS AND AN INTRO TO CALCULUS | ● Homework Questions  
● Limits at Infinity and Limits of Sequences  
● The Area Problem  
● Extra Credit Questions  
|  
| Day 21- TOPICS IN ANALYTIC GEOMETRY | ● Homework Questions  
● Parametric Equations  
● Polar Coordinates  
● Graphs of Polar Equations  
● Extra Credit Questions  
|  
| Day 22- TOPICS IN ANALYTIC GEOMETRY | ● Homework Questions  
● Rotation and Systems of Quadratic Equations  
● Polar Equations of Conics  
● The Tangent Line Problem  
● Introduction To The Derivative  
|  
| Day 23- Final Exam Review | ● Homework Questions  
● Chapter 1 Review  
● Chapter 2 Review  
|
WEEK 3

Day 11- Final Review
- Chapter 1 Review
- Chapter 2 Review
- Chapter 3 Review
- Chapter 4 Review
- Chapter 5 Review

Day 12- FINALS DAY!
- Review Questions
- Final

Day 24- Final and Fun
- Final Review Questions
- Final Exam
- Final Exam Questions
- Diagnostic Test

Course Materials:

Textbook will be provided to student on the first day of class.

PLEASE NOTE: You will be charged a fine for a damaged or lost textbook.

Each student is to have the following materials daily:

1. Three-ring binder.
2. 3-hole punched lined, college-rule paper.
3. 3-hole punched graph paper
4. Stationery, such as pencils, red pens, etc.
5. Graphing Calculator (preferably TI-84).

Course Grading

Homework, Classwork and Tests

- **Homework** is assigned daily and is due the following school day. Each assignment is worth 10 points.
- A **Final** will be given after each 2 ½ week session. It will only cover the topics in that session and will be worth 100 points each.

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Notes</td>
<td>10%</td>
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<tr>
<td>Test One</td>
<td>20%</td>
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<tr>
<td>Test Two</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<tr>
<td>Class Participation</td>
<td>10%</td>
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</table>
Grading Policy:

A = 100% to 94%
A- = 93% to 90%
B+ = 89% to 87%
B = 86% to 83%
B- = 82% to 80%
C+ = 79% to 77%
C = 76% to 73%
C- = 72% to 70%
D+ = 69% to 67%
D = 66% to 63%
D- = 62% to 60%
F = 60% & Below

Academic Integrity

Plagiarism
Plagiarism: “1. the unauthorized use or close imitation of the language and thoughts of another author and the representation of them as one's own original work.”

Access to technology makes it easier to copy the work of others. The students will learn what constitutes plagiarism and how to steer clear of it. As a rule, if there are three words in a row that someone else can claim, cite it. Plagiarism is stealing and cheating and will not be tolerated. Plagiarism is against the law.

The first time a student is caught plagiarizing, there will be a teacher/student conference, a phone call home, no credit given for the assignment, and notification given to the SAEP office.

Copying from a fellow classmate is also unacceptable on homework assignments and individual assessments. The consequences are the same as above.

Cheating
Cheating is a reprehensible act subject to a zero tolerance policy. For those in doubt about what is considered cheating, here are a few examples:

1. Glancing at another’s quiz or test.
2. Talking (in ANY language).
3. Using notes, opening a textbook and/or notebook.
4. Copying (or orally receiving answers) from a fellow classmate (or anyone else) is also unacceptable on homework assignments.
ANY STUDENT SUSPECTED OF CHEATING IN ANY WAY WILL RECEIVE AN AUTOMATIC “ZERO” ON THAT QUIZ OR TEST. A SECOND TIME WILL RESULT IN BEING AUTOMATICALLY DROPPED FROM THE COURSE

Teacherease.com:
Parents and students can access grades and attendance through a web-based grade program at teacherease.com. By the end of the first week, parents will be emailed the password to access the program. If you do not receive your password via email, please contact the office staff at saep@csun.edu and request the password to be re-sent. It is beneficial for you to refer often to the website to check your child's progress and attendance in class. If you have any questions, please feel free to email me.

Classroom Behavior:
The student is expected to demonstrate mature, polite behavior and extend courtesy to everyone at all times:
1. Actively participate, and respectful verbal and nonverbal interaction with all opinions must be shown at all times.
2. Since differing views will be expressed, the teacher and the student(s) will mutually maintain a safe environment for courteous dialogue.
3. Respect is to be shown for all CSUN property.
4. No food or beverages will be permitted in the classroom. Snacks must be eaten outside between the designated breaks.
5. Warnings for behavior / discipline problems will be given once. Any further problems will result in a phone call to the parent(s) or guardian(s) and possible dismissal from the program.

SAEP Electronics Policy

Cell phones, music players and headphones are not permitted to be used during class hours.
   a. Please put your cell phone on silent (NOT vibrate).
   b. No texting is allowed during class.

You will be given one verbal warning if the above is not followed. Should a second warning be necessary, your cell phone, music player and/or headphones will be confiscated and held by the teacher until after class. If a third time occurs, your cell phone, music player and/or headphones will be confiscated and held in the SAEP office and MUST BE PICKED UP BY A PARENT.
Math Analysis/ Trigonometry

After reading through the syllabus, please sign and date and have your student return it to class. The signature constitutes your commitment to the class as we partner to make the next five weeks a life-long educational experience for your student.

**Student/ Parent Agreement:**
Please bring this signed and dated Math Analysis/ Trigonometry syllabus agreement to class tomorrow.

If you do not understand any portion of this syllabus, or if you have any questions regarding this class, please do not hesitate to email the teacher.

We have read and understand the contents of this syllabus.

Student name __________________________________________________________

Student signature _______________________________________________________

Date ____________________________

Parent/Guardian name __________________________________________________

Parent/Guardian signature ______________________________________________

Date ____________________________

Phone ____________________________

E-mail _______________________________