MATHEMATICS

Math Analysis

Grades 9-12		
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.**	**3. (Standard #3 located in Algebra 3-4.)**
4. (Standard #4 located in Algebra 3-4.)	**5. 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, etc.). 5.2 Students can take a geometric description of a conic section (e.g. 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. Students find the roots and poles of a rational function, can graph the function, and can 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 a limit of a sequence and the limit of a function as the independent variable approaches a number or infinity. They determine if certain sequences converge or diverge.**	**T4. Students graph functions of the form $f(t) = A \sin(Bt + \varphi)$ or $f(t) = A \cos(Bt + \varphi)$, and interpret A, B, and φ in terms of amplitude, frequency, period, and phase shift.**

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Grades 9-12		
T5. Students know the definition of the tangent and cotangent functions, and can graph them.	**T6. Students know the definitions of the secant and cosecant functions, and can graph them.**	**T7. Students know that the tangent of the angle a line makes with the x-axis is equal to the slope of the line.**
T8. Students know the definitions of the inverse trigonometric functions, and can graph the functions.	**T10. Students compute, by hand, the values of the trigonometric functions and the inverse trigonometric functions at various standard points.**	**T11. Students demonstrate understanding of half angle and double angle formulas for sines and cosines, and can use them to prove and/or simplify other trigonometric identities.**
T13. Students know the Laws of Sines and the Law of Cosines, and apply them to problems.	**T14. Students determine the area of a triangle given one angle and the two adjacent sides.**	**T15. Students are familiar with polar coordinates. In particular, they can determine polar coordinates of a point given in rectangular coordinates, and vice versa.**
T16. Students represent equations give in rectangular coordinates in terms of polar coordinates.	**T17. Students are familiar with complex numbers. They can represent a complex number in polar form, and know how to multiply complex numbers in their polar form.**	**T19. Students are adept at using trigonometry in a variety of applications and word problems.**
LA7. Students demonstrate understanding of the geometric interpretation of vectors and vector addition (via parallelograms) for vectors in the plane and in three dimensional space.	**LA12. Students compute the scalar (dot) product of two vectors in n-dimensional space, and know that perpendicular vectors have zero dot product.**	