

Analysis Course Outline

Text: *Finite Mathematics*, Lial, Greenwell, Ritchey, Pearson Addison Wesley 2005

Text: *Precalculus Graphical, Numerical, Algebraic*, Demana, Waits, Foley, Kennedy, Pearson Addison Wesley 2007

Text: *Pre-Calculus Mathematics*, Shanks, Fleenor, Brumfeld, Addison Wesley, 1981

Text: *Limits, A Transition to Calculus*, Buchanan, Houghton Mifflin, 1985

Text: *Calculus, Concepts and Applications*, Foerster, Key Curriculum Press, 1998

Semester One

Unit 1 – Probability and Statistics

Topic (*Topic – optional)	Standard (Standard* - review)	# of Days	Homework
Basic Combinatorics	P.S. 1.0 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.	1	DWFK
Combinations and Permutations	Alg II 18.0 Students use fundamental counting principals to compute combinations and permutations* Alg II 19.0 Students use combinations and permutations to compute probabilities*	1	Finite
Venn Diagrams and Conditional Probability		1	DWFK
Mutually Exclusive Empirical Probability		1	Finite
Conditional Probability	P.S. 2.0 Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces	1	Finite
Probability Applications	P.S. 3.0 Students demonstrate an understanding of the notion of discrete random variables by using them to solve for the probabilities of outcomes	1	Finite
Binomial Theorem And Probability	Alg II 20.0 Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers*	1	Finite
Expected Value		1	Finite
*Bayes Theorem		1	Finite
Sequences	M.A. 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.	1	DWFK
Series	Alg II 22.0 Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series*	1	DWFK

	Alg II 23.0 Students derive the summation formulas for arithmetic series and for both finite and infinite geometric series*		
Math Induction	M.A. 3.0 Students can give proofs of various formulas by using the technique of mathematical induction	1	DWFK
*Logic		2	Finite
Statistics – Graphical	P.S. 8.0 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.	1	DWFK
Statistics – Algebraic	P.S. 6.0 Students know the definitions of mean, median, and mode of a distribution of data and can compute each in particular situations	1	DWFK Finite
Standard Deviation and Variance	P.S. 5.0 Students determine the mean and the standard deviation of a normally distributed random variable. P.S. 7.0 Students compute the variance and the standard deviation of a distribution of data.	1	Finite DWFK
Normal Distribution Binomial Distribution	P.S. 6.0 Students are familiar with the standard distributions (normal, binomial, and exponential) and can use them to solve for events in problems in which the distribution belongs to those families	1	Finite

Unit 2 - Functions Review and Modeling

Topic (*Topic – optional)	Standard (Standard* - review)	# of Days	Homework
12Basic Functions		1	DWFK
Composition of Functions, Implicit Functions	Alg II 24.0 Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions*	1	DWFK
Inverse and Parametric Functions	M.A. 7.0 Students demonstrate an understanding of functions and equations defined parametrically and can graph them.	1	DWFK
Transformations of Functions		1	DWFK
Modeling and correlation		1	DWFK P 197 (13-18,35,37, 61, 63)
Polynomial Functions	M.A. 4.0 Students know the statement of, and can apply, the fundamental theorem of algebra	1	DWFK
Rational Functions/ Solving Rational Equations and Inequalities	M.A. 6.0 Alg II 15.0 Students determine whether a specific algebraic statement involving rational expressions, radical expressions,	1	DWFK

	or logarithmic or exponential functions is sometimes true, always true, or never true.*		
Exponential, Logarithmic and Logistic Functions		1	DWFK
Exponential and Logistic Modeling		1	DWFK
Properties of Logarithms/ Solving Equations	Alg II 14.0 Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.*	1	DWFK
*Math of Finance		1	DWFK

Unit 3 – Trigonometry

Topic (*Topic – optional)	Standard (Standard* - review)	# of Days	Homework
Trig Review/ Sinusoidal Motion	Trig 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.*	1	DWFK
Trig Graphs	Trig 5.0 Students know the definitions of the tangent and cotangent functions and can graph them.* Trig 6.0 Students know the definitions of the secant and cosecant functions and can graph them.*	1	DWFK
Composite Trig Functions		1	DWFK
Inverse Trig Functions $\sec^{-1} x$ $\csc^{-1} x$ $\cot^{-1} x$	Trig 8.0 Students know the definitions of the inverse trigonometric functions and can graph the functions*	1	DWFK
Solving Right Triangles		1	DWFK
Basic Trig Identities		1	DWFK
More Trig Identities	Trig 11.0 Students demonstrate an understanding of the half-angle and double angle formulas for sines and cosines and their proofs and can use those formulas to prove and/or simplify other trigonometric identities*	1	DWFK
• Law of Sines/ Cosines	Trig 13.0 Students know the law of sines and the law of cosines and apply those laws to solve problems*	1	DWFK

Unit 4 – Vectors

Topic (*Topic – optional)	Standard (Standard* - review)	# of Days	Homework
Vector Notation and Algebra	M.A. 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. L.A. 4.0 Students perform addition on matrices and vectors	1	DWFK Shanks
Dot Product and Vector Projection	L.A. 12.0 Students compute the scalar (dot) product of two vectors in n-dimensional space and know that perpendicular vectors have zero dot product.	1	DWFK
Vector Equation of Lines		1	Shanks
Parametric Equation and Motion	M.A. 7.0 Students demonstrate an understanding of functions and equations defined parametrically and can graph them.	1	DWFK
Directed Distances		1	Shanks
Parallel and Perpendicular		1	Shanks
Space Coordinatization		1	Shanks
Direction Cosines and Lines in Space		1	Shanks
Planes in Space		1	Shanks
Vectors in Space	L.A. 7.0 Students demonstrate an understanding of the geometric interpretation of vectors and vector addition in the plane and in three-dimensional space	1	Shanks
Vector Equations of Lines		1	Shanks
Angle between Vectors in Space		1	Shanks
Normal to a Line		1	Shanks
Normal to a Plane		1	Shanks
Cross Product		1	Shanks
Vector Products and Application		1	Shanks

Unit 5 –Polar Graphs

Topic (*Topic – optional)	Standard (Standard* - review)	# of Days	Homework
Polar Coordinates and Graphs	M.A.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	1	DWFK

	coordinates and vectors graphically.		
Analyzing Polar Graphs		1	DWFK Shanks
Polar and Rectangular Equations	M.A. 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.	1	Shanks
Intersection of Polar Graphs		1	Shanks
Other Coordinate Systems – Complex Plane	M.A. 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 the DeMoivre's Theorem	1	DWFK
• Cylindrical and Spherical Coordinates		1	Shanks

Semester Two

Unit 6 – Matrices

Topic (*Topic – optional)	Standard	# of Days	Homework
Systems of Equations Echelon Method	L.A.3.0 Students reduce rectangular matrices to row echelon form	1	Finite
Matrix Algebra	L.A.4.0 Students perform addition on matrices and vectors L.A. 5.0 Students perform matrix multiplication and multiply vectors by matrices and scalars L.A. 10.0 Students compute the determinants of 2X2 and 3X3 matrices and are familiar with their geometric interpretations the as area/volume of the parallelepipeds spanned by the images under the matrices of the standard basis vectors in two and three dimensional spaces.	1	DWFK Finite
Matrix Transformations		1-2	DWFK
*Fractals		1	
Inverse Matrices	L.A. 9.0 Students demonstrate an understanding of the notion of the inverse to a square matrix and apply that concept to solve systems of linear equations L.A. 11.0 Students know that a square matrix is invertible if, and only if, its determinant is nonzero. They can compute the inverse to a 2X2 and 3X3 matrices using row reduction methods	1	DWFK Finite

	or Cramer's Rule.		
Gauss-Jordan Elimination	L.A. 1.0 Students solve linear equations in any number of variables by using Gauss-Jordan elimination L.A. 2.0 Students interpret linear systems as coefficient matrices and the Gauss-Jordan method as row operations on the coefficient matrix.	1	DWFK Finite
Solving Systems with Matrices	L.A. 6.0 Students demonstrate an understanding that linear systems are inconsistent, have exactly one solution, or have infinitely many solutions L.A. 8.0 Students interpret geometrically the solution sets of systems of equations	1	DWFK Finite
Partial Fractions		1	DWFK
Input/Output Models		1	Finite
Linear Programming		1	DWFK
Linear Programming/ Corner Point Theorem		1	DWFK Finite
Simplex Method		1	Finite
* Maximization and Duality		2	Finite

Unit 7 –Further Applications of Matrices

Topic (*Topic – optional)	Standard	# of Days	Homework
Basic Properties of Markov Chains		.5	Finite
Regular Markov Chains		.5	Finite
Absorbing Markov Chains		1	Finite
* Game Theory- Strictly Determined Games		1	Finite
* Mixed Strategies		1	Finite
* Game Theory and Linear Programming		1	Finite
*Extended Appl		2-3	

Unit 8 – Sequences and Series

Topic (*Topic – optional)	Standard	# of Days	Homework
Sequences, Limits, Convergence		2	Buchanan
Divergence		1	Buchanan
Inc/Dec Boundedness		1	Buchanan
More Inc/Dec		1	Buchanan
*Applications		1	Buchanan
Limits of Sequences		1	Buchanan
Sequence of Partial Sums		1	Buchanan

* Applications		1	Buchanan
Infinite Series		1	Buchanan
Convergence Tests/ Alternating Series/ Ratio Test		1	Buchanan

Unit 9 – Calculus (all assignments are from Foerster Calculus)

Topic	Standard	# of Days	Homework
Introduction to Calculus: Derivative		1	1.1 1.2
Into to Integral		2	1.3 1.4
Intro To Limit and Discontinuities		1	1.5
Quiz		1	2.1
Formal definition of Limit		1	2.2
Limit Theorems		1	2.3
Continuity One-sided Limits		1	2.4
Limits at Infinity/ Infinite Limits		1	2.5
Intermediate Value Theorem		1	2.6
Review and Test		2	3.1
Difference Quotients/ Definition of Derivative		1	3.2
Other difference quotients		1	3.3
Formal Def of Derivative/Prop of deriv		1	3.4
Deriv of Sine/Cosine		1	3.5
Displacement, Velocity, Acceleration		1	3.6
Chain Rule		1	3.7
Proof of deriv of Sine/Cosine Sinusoidal Equations		1	3.8
Antiderivatives		1	3.9
Review and Test		2	4.1
Product Rule		1	4.2
Quotient Rule		1	4.3
Deriv of Other Trig		1	4.4
Deriv of Inverse Trig		1	4.5
Differentiability and Continuity		1	4.6
Deriv of Parametric		1	4.7
Implicit Differentiation		1	4.8