The Asian International School Curriculum Mapping

Grade: 11 (TOEFL-Beginner) Subject: Mathematics School Year: 2018-2019

Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments

Aug.	**2**	AERO HSS.CP.9 (+)	Patterns, Functions, and Algebra	**Chapter 1: Sequences**
				Unit 1: Introduction
				• Functions
				  ○ Definition
				  ○ Substitution
				  ○ Composition of functions
				• Sums
				  ○ Definition and notation
				  ○ Finite Sums
				• Products
				  ○ Definition and notation
				  ○ Finite Products
					• Understand what functions are
					• Understand how to substitute both constants and variables into given functions
					• Understand how to compose functions and that function composition is not commutative
					• Understand the notation for finite sums and how to calculate them
					• Understand the notation for finite products and how to calculate them
						• Group Work
						• Mini-Research Projects
						• Computer Projects
						• Worksheets
							• Group Presentations
							• Individual Presentations
							• Worksheets

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	5	AERO HSS.CP.9 (+) AERO HSAAPR.5 (+)	Patterns, Functions, and Algebra	**Chapter 1: Sequences** **Unit 2: Combinatorics** • Factorial: $n! = 1 \cdot 2 \cdots n = \prod_{j=1}^{n} j$ $0! = 1! = 1$ • Permutation: $P(n,r) = {}_nP_r = \frac{n!}{(n-r)!}$ • Combination: $C(n,r) = {}_nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$ • Binomial expansion $(a+b)^n = \sum_{k=0}^{n} \binom{n}{k} a^{n-k} b^k$ • Pascal's Triangle gives the terms of binomial expansion	• State the definitions of ○ Factorial ○ Permutation ○ Combination • Explain why factorials grow very large very quickly. Example: $100! > 9.3326 \times 10^{157}$ • Explain how to simplify Permutations and Combinations to make calculating them easier.	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Sept.	**4**	AERO. 5.OA.3 AERO. HSF.BF.2 AERO.HSF. LE.2 AERO.HSF. 1F.3	Patterns, Functions, and Algebra	**Chapter 1: Sequences**
				Unit 3: Introduction to Sequences
				• Definitions
				  ○ Finite Sequence
				  ○ Infinite Sequence
				• Sequence given by
				  ○ General term
				  ○ Recursive method (Fibonacci Sequence)
				• Increasing, decreasing, and bounded sequences
					• Define finite and infinite sequences
					• Determine a sequence given a general term.
					• Find the general term given a sample sequence of numbers.
					• Discuss recursive methods
					• Understand and calculate the Fibonacci Sequence
					• Define and identify increasing, decreasing, and bounded sequences.
						• Group Work
						• Mini-Research Projects
						• Computer Projects
						• Worksheets
							• Group Presentations
							• Individual Presentations
							• Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Sept. - Oct.	**3**		Patterns, Functions, and Algebra	**Chapter 1: Sequences** **Comprehensive Project** • Comprehensive group project intended to demonstrate the students comprehensive understanding and functional knowledge of the material from Chapter 1.	• Students will demonstrate their functional knowledge of the material from Chapter 1.	• Comprehensive Group Project • Preferred for the students to do the project outside of class and present their results to the class.	• Presentation of the Group Project to the class.
Oct.	**2**		Patterns, Functions, and Algebra	**Review for Midterm Exam**	**Chapter 1: Sequences** • Unit 1: Introduction • Unit 2: Combinatorics • Unit 3: Introduction to Sequences		
MIDTERM EXAM							

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Nov.	**2**	LC.1.C.1	Patterns, Functions, and Algebra	**Chapter 2: Limits** **Unit 1: Limit of a Sequence** • Definition • Convergent Sequences ◦ Special limits ◦ Theorem on finite limits • Divergent Sequences	• Define the limit of a sequence • Calculate limits of sequences	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
	4	LC.1.C.2 LC.1.C.3 LC.1.C.4 LC.1.C.5	Patterns, Functions, and Algebra	**Chapter 2: Limits** **Unit 2: Limits of Functions** • Definition • One sided limits • Limit Rules • The limit exists iff the limit from the right and the limit from the left both exist and are equal. • Infinite Limits • Rules for limits	• Define the limit of a function • Take simple limits • State and use the theorems on limits • Define one-sided limits • Take one-sided limits • Define infinite limits • Understand and state the properties on infinite limits • Understand and state the rules for infinite limits	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
	2	LC.1.C.6	Patterns, Functions, and Algebra	**Chapter 2: Limits** **Unit 3: Continuous Functions** • Definitions ◦ Continuous at a point ◦ Continuous on open or close interval ◦ Discontinuous at a point ◦ Discontinuous on an interval (Supplement) • Basic theorems	• Define what it means for a function to be continuous at a point • Define what it means to be continuous on open, closed, and half-open intervals • Define what it means to be discontinuous at a point • Define what it means to be continuous over an open, closed, or half-open interval • State the basic theorems on continuity	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Dec.	**3**		Patterns, Functions, and Algebra	**Chapter 2: Limits** **Comprehensive Project** Comprehensive group project intended to demonstrate the students comprehensive understanding and functional knowledge of the material from Chapter 2.	• Students will demonstrate their functional knowledge of the material from Chapter 2.	• Comprehensive Group Project • Preferred for the students to do the project outside of class and present their results to the class.	• Presentation of the Group Project to the class.
	2		Patterns, Functions, and Algebra	**Review for Final Exam**	**Chapter 2: Limits** • Unit 1: Limit of a Sequence • Unit 2: Limit of a Function • Unit 3: Continuous Functions		
FINAL EXAM							

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Jan.	**2**	D.2.C.1 D.2.C.2 D.2.C.3 D.2.C.4 D.2.C.5	Patterns, Functions, and Algebra	**Chapter 3: Derivatives** **Unit 1: Introduction to derivatives** • The slope of the line tangent to a curve • Derive the definition of derivative as the slope of a line tangent to a curve • Either Lagrange or Leibniz notation is fine, but we normally prefer Leibniz notation: $\frac{d}{dx}f(x) = f'(x)$	• Understand the historical problems that led to the development of the derivative • Understand and be able to repeat Leibniz's construction of the derivative • Understand why we prefer Leibniz's notation over Newton's notation • Calculate some basic derivatives using Leibniz's definition of the derivative	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
	5	D.2.C.7	Patterns, Functions, and Algebra	**Chapter 3: Derivatives** **Unit 2: Rules for Taking Derivatives** • Derivative Rules ◦ Constant Rule ◦ Power Rule ◦ Sum/Difference Rule ◦ Product Rule ◦ Quotient Rule ◦ Chain Rule • Derivatives of Common Functions ◦ $\frac{d}{dx}x^{-n} = -nx^{-(n+1)}$ ◦ $\frac{d}{dx}\sqrt{x} = \frac{\sqrt{x}}{2x}$ ◦ $\frac{d}{dx}\sqrt{f(x)} = \left(\frac{\sqrt{f(x)}}{2f(x)}\right)\frac{d}{dx}f(x)$	• Take derivatives using the formulas for common functions • Take derivatives involving sum, difference, product, and quotient • Take derivatives of composite functions	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Jan. - Feb.	**5**	D.2.C.1 D.2.C.2 D.2.C.3 D.2.C.4 D.2.C.5	Patterns, Functions, and Algebra	**Chapter 3: Derivatives** **Unit 3: Derivatives of Trig Functions** • Derivatives of ◦ $\sin(x)$ ◦ $\cos(x)$ ◦ $\tan(x)$ ◦ $\csc(x)$ ◦ $\sec(x)$ ◦ $\cot(x)$	• Quickly state the derivatives of the basic trig functions • Use the derivatives of the basic trig functions to solve word problems. • Be able to prove all of the derivative formulas except for $\sin(x)$.	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets
Feb.	**2**		Patterns, Functions, and Algebra	**Chapter 3: Derivatives** **Comprehensive Project** Comprehensive group project intended to demonstrate the students comprehensive understanding and functional knowledge of the material from Chapter 3.	• Students will demonstrate their functional knowledge of the material from Chapter 3.	• Comprehensive Group Project • Preferred for the students to do the project outside of class and present their results to the class.	• Presentation of the Group Project to the class.

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
Mar.	**2**		Patterns, Functions, and Algebra	**Review for Midterm Exam**	**Chapter 3: Derivatives** • Unit 1: Introduction to Derivatives • Unit 2: Rules for Calculating Derivatives • Unit 3: Derivatives of Trig Functions		
MIDTERM EXAM							
Mar.	**2**	AERO HSN.CN.1 AERO HSN.CN.2	Patterns, Functions, and Algebra	**Chapter 4: Complex Numbers, Euler's number, and Logarithms** **Unit 1: Complex Numbers** • Definitions ◦ $i = \sqrt{-1}$ ◦ $\mathbb{C} = \{a + bi \mid a, b \in \Re\}$ • Prove that $-\frac{1}{i} = i$ • Equal complex number • Complex Conjugate • Adding, subtracting, multiplying and dividing complex numbers	• Understand how complex numbers can be used to solve other types of problems. • Understand the applications of complex numbers to modern physics.	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Mar. - Apr.	**2**	AERO. HSF.BF.5. (+)	Patterns, Functions, and Algebra	**Chapter 4: e and Logarithms** **Unit 2: Natural Logarithms** • Definition of $e^x = \lim_{n\to\infty}\left(1+\frac{x}{n}\right)^n$ • Estimate e using the definition above. • Define general logarithms • Define common logarithms • Define Natural logarithms • Rules for natural logarithms	• Recognize common and natural logarithms. • Understand the basic concepts of log and exponential functions. • Understand how log and exponential functions relate to the real world.	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Apr.	**4**	AERO.HSF.1F.7 AERO.HSA.REI.11	Patterns, Functions, and Algebra	**Chapter 4: e and Logarithms** **Unit 3: Functions with e and ln** • Derivatives of ◦ $\frac{d}{dx}e^x = e^x$ ◦ $\frac{d}{dx}\ln x = \frac{1}{x}$ ◦ $\frac{d}{dx}e^{f(x)} = f'(x)e^{f(x)}$ ◦ $\frac{d}{dx}\ln f(x) = \frac{f'(x)}{f(x)}$ • Derivatives of other functions involving e and ln. • Euler's ◦ Formula: $e^{ix} = \cos(x) - i\sin(x)$ ◦ Identity: $e^{i\pi} = -1$	• Take derivatives for log and exponential functions. • Understand and state Euler's formula and Euler's identity • Explain the importance of Euler's formula and identity in our modern world.	• Group Work • Mini-Research Projects • Computer Projects • Worksheets	• Group Presentations • Individual Presentations • Worksheets

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Month	# of Days	Core Standard	Strand	Content	Skills	Activities	Assessments
	2		Patterns, Functions, and Algebra	**Chapter 4: e and Logarithms** **Comprehensive Project** Comprehensive group project intended to demonstrate the students comprehensive understanding and functional knowledge of the material from Chapter 4.	• Students will demonstrate their functional knowledge of the material from Chapter 4.	• Comprehensive Group Project • Preferred for the students to do the project outside of class and present their results to the class.	• Presentation of the Group Project to the class.
	2		Patterns, Functions, and Algebra	**Review for Final Exam**	**Chapter 4: e and Logarithms** Unit 1: Complex Numbers Unit 2: Natural Logarithms Unit 3: Functions with e and ln		
FINAL EXAM							