Knox County Prioritized Mathematics Curriculum
College Prep Calculus: 3113

Key
C-Compact - objectives that have been previously taught
A-Assessed – objectives assessed by Knox County or the state
I-Important - objectives providing enrichment skills or support to subsequent mathematics courses (optional)

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Chapter 1: Limits and Their Properties

Vocabulary	Writing Prompts
Calculus, secant line, tangent line, limit, oscillating, direct substitution, ,continuity, indeterminate form, removable discontinuity, infinite limit	What is a secant line? What is a tangent line? State the definition of continuity at x=c.

Key	State Performance Indicators	Knox County Performance Objectives	Textbook Correlation	
			Section	Pages
C		What is Calculus?	1.1	40-47
A		The Tangent Line Problem		
A		The Area Problem		
A	1.2b Estimate limits from graphs or tables.	An Introduction to Limits	1.2	48-56
A	1.2b Estimate limits from graphs or tables.	Limits That Fail to Exist		
I		A Formal Definition of a Limit		
A	1.2a Calculate limits using algebra.	Properties of Limits	1.3	57-67
A	1.2a Calculate limits using algebra.	A Strategy for Finding Limits		
A	1.2a Calculate limits using algebra.	Cancellation and Rationalization Techniques		
I	1.2a Calculate limits using algebra.	The Squeeze Theorem		
A	1.5b Demonstrate an understanding of graphs of continuous functions.	Continuity at a Point and on an Open Interval	1.4	68-79
A	1.5a Demonstrate an understanding of continuity in terms of limits	One-Sided Limits and Continuity of a Closed Interval		
A	1.5a Demonstrate an understanding of continuity in terms of limits	Properties of Continuity		
I	1.5b Demonstrate an understanding of graphs of continuous functions	The Intermediate Value Theorem		

A	1.4b Describe asymptotic behavior in terms of infinite limits and limits at infinity	Infinite Limits	1.5	80-91
A	1.4a Demonstrate an understanding of asymptotes in terms of graphical behavior	Vertical Asymptotes		

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Chapter 2: Differentiation

Vocabulary	Writing Prompts
Difference quotient, change in x, change in y, vertical tangent line, derivative, differentiable, differentiation, position function, velocity, second derivative, acceleration, higher-order derivative, explicit form, implicit differentiation, related-rate	Describe an explicitly defined function of y in terms of x. Describe an implicitly defined function of y in terms of x.

Key	State Performance Indicators	Knox County Performance Objectives	Textbook Correlation	
			Section	Pages
A	2.1a Represent the concept of the derivative geometrically, numerically, and analytically	The Tangent Line Problem	2.1	94-104
A	2.1c Define the derivative as the limit of the difference quotient	The Derivative of a Function		
A	2.1c Define the derivative as the limit of the difference quotient	Differentiability and Continuity		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Constant Rule	2.2	105-116
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Power Rule		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Constant Multiple Rule		

A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Sum and Difference Rules		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	Derivatives of Sine and Cosine		
A	2.5a Interpret the derivative as a rate of change in varied applied contexts	Rate of Change		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Product Rule	2.3	117-126
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient	The Quotient Rule		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotients	Derivatives of Trigonometric Functions		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotients	Higher-Order Derivatives		
A	2.4c Use the chain rule and implicit differentiation	The Chain Rule	2.4	127-136
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotients	The General Power Rule		
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotients	Simplifying Derivatives		

A	2.4c Use the chain rule and implicit differentiation	Trigonometric Functions and the Chain Rule		
A	2.4c Use the chain rule and implicit differentiation	Implicit and Explicit Functions	2.5	137-143
A	2.4c Use the chain rule and implicit differentiation	Implicit Differentiation		
A	2.5d Model rates of change, including related rates problems	Finding Related Rates	2.6	144-157
A	2.5d Model rates of change, including related rates problems	Problem Solving with Related Rates		

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Chapter 3: Applications of Differentiation

Vocabulary	Writing Prompts
Extrema, absolute maximum, absolute minimum, relative minimum, relative maximum, critical number, Mean Value Theorem, increasing, decreasing, strictly monotonic, concave upward, concave downward, horizontal asymptote, primary equation, First Derivative Test, Second Derivative Test, horizontal asymptote, slant asymptote, vertical asymptote, differential	Explain the process of solving an optimization problem. Can a function have both a horizontal asymptote and a slant asymptote? Explain your answer.

Key	State Performance Indicators	Knox County Performance Objectives	Textbook Correlation	
			Section	Pages
A	2.3b Communicate the relationship between the increasing and decreasing behavior f and the sign of f’	Extrema of a Function	3.1	160-167
A	2.3b Communicate the relationship between the increasing and decreasing behavior f and the sign of f’	Relative Extrema and Critical Numbers		
A	2.5c Optimization, both absolute (global) and relative (local) extrema	Finding Extrema on a Closed Interval		

A	2.5a Translate verbal descriptions into equations involving derivatives and vice versa	Rolle's Theorem	3.2	168-173
A	2.5a Translate verbal descriptions into equations involving derivatives and vice versa	Mean Value Theorem		
A	2.3b Communicate the relationship between the increasing and decreasing behavior f and the sign of f'	Increasing and Decreasing Functions	3.3	174-183
A	2.3b Communicate the relationship between the increasing and decreasing behavior f and the sign of f'	First Derivative Test		
A	2.5b Analyze curves using notions of monotonicity and concavity	Concavity	3.4	184-191
A	2.3a Identify points of inflection	Points of Inflection		
A	2.3d Communicate the relationship between the concavity of f and the sign of f''	Second Derivative Test		
A	1.4b Describe asymptotic behavior in terms of infinite limits and limits at infinity	Limits at Infinity	3.5	192-201
A	1.4b Describe asymptotic behavior in terms of infinite limits and limits at infinity	Horizontal Asymptotes		
A	1.4b Describe asymptotic behavior in terms of infinite limits and limits at infinity	Infinite Limits at Infinity		
A	2.5b Analyze curves using the notions of monotonicity and concavity	Analyzing the Graph of a Function	3.6	202-210
A	2.5a Translate verbal descriptions into equations involving derivatives and vice versa	Applied Minimum and Maximum Problems	3.7	211-221

I		Newton's Method	3.8	222-227
I		Linear Approximations	3.9	228-234
I		Differentials		

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Chapter 4: Integration

Vocabulary	Writing Prompts
Antiderivative, constant of integration, general solution, differential equation, indefinite integral, initial condition, particular solution, Riemann sum, definite integral, limits of integration, Fundamental Theorem of Calculus, average value of a function, u-substitution, change of variables, Trapezoidal Rule.	What is the difference between a definite and indefinite integral? What are appropriate methods for evaluating integrals that cannot be represented by standard integral properties? What are appropriate methods of approximating the values of integrals which cannot be integrated?

Key	State Performance Indicators	Knox County Performance Objectives	Textbook Correlation	
			Section	Pages
A	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Antiderivative	4.1	242-252
A	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Notation for Antiderivative		
A	3.1b Apply basic properties of definite integrals.	Basic Integration Rules		
A	3.2b Find specific Antiderivatives using initial conditions.	Initial Conditions and Particular Solutions		

I	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Sigma Notation	4.2	253-264
I	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Area		
A	3.1a Communicate the relationship between a Riemann sum and a definite integral.	The Area of a Plane Region		
A	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Upper and Lower Sums		
I	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Riemann Sums	4.3	265-274
A	3.1a Communicate the relationship between a Riemann sum and a definite integral.	Definite Integrals		
A	3.1b Apply basic properties of definite integrals	Properties of Definite Integrals		
A	3.2a Evaluate definite integrals using the Fundamental Theorem	The Fundamental Theorem of Calculus	4.4	275-287
I	3.2a Evaluate definite integrals using the Fundamental Theorem	The Mean Value Theorem for Integrals		
A	3.2a Evaluate definite integrals using the Fundamental Theorem	Average Value of a Function		
I	3.2a Evaluate definite integrals using the Fundamental Theorem	The Second Fundamental Theorem of Calculus	4.4	275-287
A	3.3a Apply techniques of antidifferentiation.	Pattern Recognition	4.5	288-299
A	3.3a Apply techniques of antidifferentiation.	Change of Variables		
A	3.3a Apply techniques of antidifferentiation.	The General Power Rule of Integration		
A	3.3a Apply techniques of antidifferentiation.	Change of Variables for Definite Integrals		
I	3.3a Apply techniques of antidifferentiation.	Integration of Even and Odd Functions		

A	3.3c Use the Trapezoidal Rule to approximate definite integrals of functions represented algebraically, geometrically, and by tables of values.	The Trapezoidal Rule	4.6	300-306
I	3.3c Use Simpson's Rule to approximate definite integrals of functions represented algebraically, geometrically, and by tables of values.	Simpson's Rule		
I	3.3c Use the Trapezoidal Rule to approximate definite integrals of functions represented algebraically, geometrically, and by tables of values.	Error Analysis		

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Chapter 5: Logarithmic, Exponential and Other Transcendental Functions

Vocabulary	Writing Prompts
Natural logarithmic function, logarithmic differentiation, solution curves, separable differential equations	What is the value of lnx in terms of the definite integral? What function is its own derivative? How can growth and decay be modeled by separable differential equations?

Key	State Performance Indicators	Knox County Performance Objectives	Textbook Correlation	
			Section	Pages
I	3.2a Evaluate definite integrals using the Fundamental Theorem	The Natural Logarithmic Function	5.1	314-323
I	3.2a Evaluate definite integrals using the Fundamental Theorem	The Number *e*		
A	3.2a Evaluate definite integrals using the Fundamental Theorem	The Derivative of the Natural Logarithmic Function		
A		Log Rule for Integration	5.2	324-331
A		Integrals of Trigonometric Functions		
I	3.3a Apply techniques of integration	Inverse Functions	5.3	332-340
I		Existence of an Inverse Function		
I		Derivative of an Inverse Function		
I		The Natural Exponential Function	5.4	341-350
A	2.4b Apply basic rules for the derivative of basic functions and their sum, product, and quotient.	Derivatives of Exponential Functions		

A	3.3a Apply techniques of integration	Integrals of Exponential Functions		
I		Bases Other than *e*	5.5	351-359
I	3.3a Apply techniques of integration	Differentiation and Integration		
I		Applications of Exponential Functions		
A	3.3b Use separable differential equations in modeling.	Differential Equations	5.6	361-368
A	3.3b Use separable differential equations in modeling.	Growth and Decay Models		
I	3.3b Use separable differential equations in modeling.	General and Particular Solutions	5.7	369-372
I	3.3b Use separable differential equations in modeling.	Separation of Variables		