

**University at Buffalo**  
**GIFTED MATH PROGRAM**

**Course V Curriculum**

Fall Semester

Course Number: MTH 141  
 Course Title: College Calculus I  
 Credit Hours: 4.0  
 Textbook: Stewart, *Calculus: Single Variable* (Early Transcendentals, 6<sup>th</sup> ed./ UB custom 6<sup>th</sup> ed.), Brooks/Cole  
 Description: This is the beginning of a 3-semester sequence in calculus for students of mathematics, natural sciences and engineering. Covers differentiation and integration with applications.  
 Prerequisite: NYS Regents Math B or MTH 115  
 Syllabus: MTH 141 covers through Chapter 5 of the text.

<i>Week</i>	<i>Section</i>	<i>Topics</i>
1	2.1	Tangent and Velocity Problems
1	2.2	Limit of a Function
1	2.3	Calculating Limits Using Limit Laws
2	2.4	Precise Definition of a Limit, Infinite Limits
2	2.5	Continuity
3	2.6	Limits at Infinity; Horizontal Asymptotes
3	2.7	Tangents, Velocities, and Other Rates of Change
4	2.8	Derivatives
4	2.9	The Derivative as a Function
4	3.1i	Derivatives of Polynomial Functions
5	1.5	Exponential Functions
5	1.6	Inverse Functions and Logarithms, Inverse Trigonometric Functions
5	3.1ii	Derivatives of Exponential Functions
5	3.2	The Product and Quotient Rules
6	3.4	Derivatives of Trigonometric Functions
6	3.5	The Chain Rule
6	3.6	Implicit Differentiation, Derivatives of Inverse Trigonometric Functions
7	3.7	Higher Derivatives
7	3.8	Derivatives of Logarithmic Functions
option	3.9	<i>Hyperbolic Functions</i>
option	3.10	<i>Related Rates</i>
7	3.11	Linear Approximation and Differentials
8	4.1	Maximum and Minimum Values
8	4.2	The Mean Value Theorem
8	4.3	How Derivatives Affect the Shape of a Graph
9	4.4	Indeterminate Forms and L'Hopital's Rule
9	4.5	Summary of Curve Sketching
option	4.6	<i>Graphing with Calculus and Calculators</i>
9	4.7	Optimization Problems
option	4.8	<i>Applications to Business and Economics</i>
option	4.9	<i>Newton's Method</i>
10	4.10	Antiderivatives
10	5.1	Areas and Distances
11	5.2	The Definite Integral
11	5.3	The Fundamental Theorem of Calculus
12	5.4	Indefinite Integrals and the Net Change Theorem
12	5.5	The Substitution Rule
option	5.6	<i>The Logarithm Defined as an Integral</i>

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Spring Semester

Course Number: MTH 142  
 Course Title: College Calculus 2  
 Credit Hours: 4.0  
 Textbook: Stewart, *Calculus: Single Variable* (Early Transcendentals, 6<sup>th</sup> ed./ UB custom 6<sup>th</sup> ed.), Brooks/Cole  
 Description: Methods of integration; infinite sequences; topics in analytic geometry; series and power series.  
 Prerequisite: MTH 141 with recommended grade of “C” or higher.  
 Syllabus: MTH 142 covers (parts of) Chapter 5 through 11 of the text.

<i>Week</i>	<i>Section</i>	<i>Topics</i>
1	5.5	The Substitution Rule
1	6.1	Areas Between Curves
2	6.2	Volumes
2	6.3	Volumes by Cylindrical Shells
<i>option</i>	6.4	<i>Work</i>
2	6.5	Average Value of a Function
3.	7.1	Integration by Parts
3	7.2	Trigonometric Integrals
4	7.3	Trigonometric Substitution
4	7.4	Integration of Rational Functions by Partial Fractions
5	7.5	Strategy for Integration
6	7.7	Approximate Integration
6	7.8	Improper Integrals
6	8.1	Arc Length
7	8.2	Area of a Surface of Revolution
<i>option</i>	8.3	<i>Applications to Physics and Engineering</i>
<i>option</i>	8.4	<i>Applications to Economics and Biology</i>
<i>option</i>	8.5	<i>Probability</i>
7	9.4	Exponential Growth and Decay
8	10.1	Curves Defined by Parametric Equations
8	10.2	Calculus with Parametric Curves
8	11.1	Sequences
9	11.2	Series
9	11.3	The Integral Test and Estimates of Sums
9	11.4	Comparison Tests
10	11.5	Alternating Series
10	11.6	Absolute Convergence & the Ratio Test
10	11.7	Strategy for Testing Series
10	11.8	Power Series
11	11.9	Representation of Functions as Power Series
11	11.10	Taylor and McLaurin Series
11	11.11	The Binomial Series
11	11.12	Applications of Taylor Polynomials
12	10.3	Polar Coordinates
12	10.4	Areas and Lengths in Polar Coordinates
<i>option</i>	10.5	<i>Conic Sections</i>
<i>option</i>	10.6	<i>Conic Sections in Polar Coordinates</i>