



Intro to Calculus - Unit E - Integration

Unit Focus

Students are introduced to the concept of an antiderivative using the concepts learned in Unit C. Using Riemann sums and sigma notation, students will see the connection of an integral to the area under a curve. Students will explore definite and indefinite integrals. Students will learn the integration technique of substitution.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1) - Reason abstractly and quantitatively. (CCSS.MATH.MP.2) - Use appropriate tools strategically. (CCSS.MATH.MP.5) - Attend to precision. (CCSS.MATH.MP.6) - Look for and make use of structure. (CCSS.MATH.MP.7) Madison Public Schools Profile of a Graduate - Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) - Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)	<i>Students will be able to independently use their learning to...</i> T1 make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. T2 apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians flexibly use different tools, strategies, and operations to build conceptual knowledge or solve problems. U2 Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. U3 Mathematicians use geometric models, and spatial sense to interpret and make sense of the physical environment.	<i>Students will keep considering...</i> Q1 What math tools/models/ strategies can I use to solve the problem? Q2 How can I simplify the problem? Q3 How can I break a problem down into manageable parts?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 the summation formulas K2 right end, left end and midpoint approximations K3 the difference between signed area and total area K4 integration by substitution	<i>Students will be skilled at...</i> S1 evaluating basic indefinite integrals S2 finding velocity and position functions given the acceleration function and initial value S3 finding a function satisfying given conditions

Stage 1: Desired Results - Key Understandings

K5 Vocabulary: antiderivative, indefinite integral, definite integral, Riemann Sums, definite integral, integrable, average value

S4 computing sums of values of $f(x)$ evaluated a) at given finite intervals b) for limit as $(\# \text{ sums}) n \rightarrow \infty$
S5 using n subintervals in a Riemann sum to compute the area under a curve
S6 evaluating definite integrals using
a) Riemann Sums
b) Fundamental Theorem of Calculus
S7 determining the area between two curves
evaluating definite integrals using methods of substitution