	Calculus CP Unit 8: Further Techniques and Applications of Integration				
Unit #:	APSDO-00019752	**Duration:**	3.0 Week(s)	**Date(s):**	

Team:
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Grades:
12
Subjects:
Mathematics

Unit Focus

In this unit students will be able to find antiderivatives using integration by parts. Students will solve applications involving volume (solids of revolution). Students will solve monetary applications, including average value, and continuous money flow. Summative assessments may include projects, labs and tests. Summative assessments may include projects, labs and tests. Primary instructional materials include: Textbook titled Calculus with Applications 8th Edition, by Margaret L. Lial, Raymond N. Greenwell, and Nathan P. Ritchey, and the Calculus in Motion utility based on Geometer's Sketchpad.

Stage 1: Desired Results - Key Understandings

Established Goals	**Transfer**
Common Core *Mathematics: 12* • Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). *CCSS.MATH.CONTENT.HSG.MG.A.1* • Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). *CCSS.MATH.CONTENT.HSG.MG.A.2* • Apply geometric methods to solve design problems (e.g., designing an object or	**T1** (T50) Based on an understanding of any problem, initiate a plan, execute it and evaluate the reasonableness of the solution. **T2** (T53) Articulate how mathematical concepts relate to one another in the context of a problem or in the theoretical sense. **T3** (T51) Examine alternate methods to accurately and efficiently solve problems. **T4** (T52) Use appropriate tools strategically to deepen understanding of mathematical concepts. **T5** (T44) Apply appropriate theorems and formulas to determine the unknown. **T6** (T41) Compose/decompose shapes or attributes to form new shapes. **T7** (T23) Use functions or equations to model relationships among quantities. **T8** (T20) Compose and decompose numbers to establish relationships, perform operations, and solve problems.

	Meaning	
structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). *CCSS.MATH.CONTENT.HSG.MG.A.3* • Look for and express regularity in repeated reasoning. *CCSS.MATH.MP.8* • Reason abstractly and quantitatively. *CCSS.MATH.MP.2*	**Understandings**	**Essential Questions**
	U1 (U511) Placing a problem in a category gives you a familiar approach to solving it. **U2** (U561) Recognition of patterns and structures fosters efficiency in solving problems. **U3** (U409) When a line intersects a 2-D shape, the areas of the new shapes add up to the area of the original. **U4** (U412) When a plane intersects with a 3-D shape, the volume of the new shapes add up to the volume of the original. **U5** (U413) Given a 3-D shape and its scale, mathematicians can compute its surface area and volume. **U6** (U208) Mathematical symbols (e.g. period, line) represent quantities and operations in agreed upon ways (e.g. decimal place holders, line to separate numerator from denominator). **U7** (U203) Certain mathematical manipulations preserve the relationship in an expression or equation, even though they change the representation.	**Q1** (Q514) What does the solution represent? **Q2** (Q572) How does understanding the pattern/structure help me solve the problem? **Q3** (Q206) How do I evaluate this function or solve the equation? (Gr. 6-12) **Q4** (Q406) What is the theorem/formula necessary to solve this problem? (Gr. 5-12) **Q5** (Q200) What rule or pattern can help me simplify the expression or solve this problem? **Q6** (Q200) What rule or pattern can help me simplify the expression or solve this problem?
	Acquisition of Knowledge and Skill	
	Knowledge	**Skills**
		S1 Use definite integrals to determine displacement and total displacement of a particle given a velocity function **S2** Use definite integrals to find the area between two curves

		S3
		Use definite integrals to find the volume of solids of a known base and solids of revolution
		S4
		Use definite integrals to find the length of a curve over a given interval
		S5
		Find the value of a definite and and indefinite integrals by using integration by parts

Stage 3: Learning Plan

Coding	Code	Description of Learning Activity