

Marking Period: 4	Unit Title: Application of Integrals	Recommended Instruction Days: 15-20
Standard-New Jersey Student Learning Standards: F-IF, F-BF		
<p>Strand: F-IF: Interpreting Functions Understand the concept of a function and use function notation 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.</p> <p>Interpret functions that arise in applications in terms of the context 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.</p> <p>F-BF: Building Functions Build a function that models a relationship between two quantities 1. Write a function that describes a relationship between two quantities a. Compose functions</p> <p>Build new functions from existing functions 3. Identify the effect on the graph replacing $f(x)$ by $f(x) + k$, $kf(x)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.</p>		
<p>LGBT and Disabilities Law: <i>N.J.S.A. 18A:35-4.35</i></p> <p>Lisa Harvey-Smith: British-Australian astrophysicist, Australia's first Women in STEM Ambassador and Professor of Practice in Science Communication at the University of NSW.</p> <p>The mission is to ensure that every student is able to see themselves in our rich and diverse history.</p>		

Social and Emotional Learning: <i>Competencies</i>	Social and Emotional Learning: <i>Sub-Competencies</i>
<p>Self-Awareness</p> <p>Social Awareness</p> <p>Self-Management</p> <p>Relationship Skills</p> <p>Responsible Decision-Making</p>	<ul style="list-style-type: none"> ● Recognizing the importance of self-confidence in handling daily tasks and challenges. ● Demonstrate an awareness of the expectations for social interactions in a variety of ways. ● Demonstrate an understanding of the need for mutual respect when viewpoints differ. ● Recognize the skills needed to establish and achieve personal and educational goals. ● Utilize positive communication and social skills to interact effectively with others. ● Develop, implement, and model effective problem solving and critical thinking skills.

**Recommended Activities, Investigations,
Interdisciplinary Connections, and/or Student
Experiences to Explore NJSLM-M within Unit**

Essential Questions	Progress Indicators	Activity Description
<ul style="list-style-type: none"> ● How are the area of bounded regions and volume of solids evaluated? ● How can one estimate and calculate the area of the bounded region between two curves? ● How can the definite integral be used to calculate the volume 	<ul style="list-style-type: none"> ● Tests ● Quizzes ● Practice problems for homework ● Worksheets ● Leveled assessments ● Projects 	<ul style="list-style-type: none"> ❖ Average Value of a function ❖ Straight-line Motion ❖ Non-Motion Application of Integrals ❖ Area: Horizontal and Vertical Areas between curves ❖ Area: Curves that intersect at more than two points ❖ Volume: Cross-sections ❖ Volume: Disc Method ❖ Volume: Washer Method ❖ Example Tasks Below

of a solid with a
known cross section?

Interdisciplinary Connections:

Personal Financial Literacy: Planning, Saving, and Investing

Julia's revenue is $r(t)$ thousand dollars per month (where t is the month of the year). Julia had made 3 thousand dollars in the first month of the year.

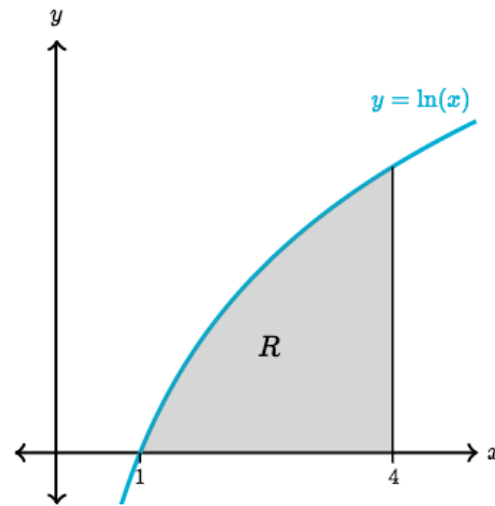
What does $3 + \int_1^5 r(t) dt = 19$ mean?

- (A) Julia made an additional 19 thousand dollars between months 1 and 5.
- (B) Julia made an average of 19 thousand dollars per month.
- (C) Julia made 19 thousand dollars in the fifth month.
- (D) By the end of the fifth month, Julia had made a total of 19 thousand dollars.

Answer
Choice D

Task

Let R be the region enclosed by the x -axis, the line $x = 4$, and the curve $y = \ln(x)$.



A solid is generated by rotating R about the x -axis.

Which one of the definite integrals gives the volume of the solid?

Choose 1 answer:

(A) $\pi \int_1^4 \ln(x) \cdot x \, dx$

(B) $\pi \int_1^4 [\ln(x)]^2 \, dx$

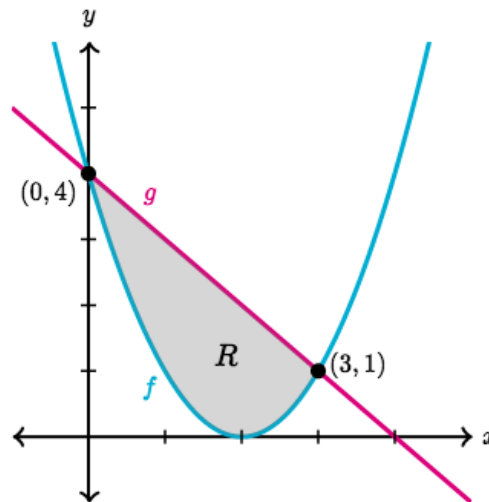
(C) $\pi \int_1^{\ln(4)} [\ln(x)]^2 \, dx$

(D) $\pi \int_1^{\ln(4)} \ln(x) \cdot x \, dx$

Answer
Choice B

Task

Let $f(x) = (x - 2)^2$ and $g(x) = 4 - x$. Let R be the region enclosed by the graphs of f and g .



Region R is the base of a solid. For each x -value, the cross section of the solid taken perpendicular to the x -axis is a rectangle whose base lies in R and whose height is $4 - x$.

		<p>Which one of the definite integrals gives the volume of the solid?</p> <p>Choose 1 answer:</p> <p>_____</p> <p>(A) $\int_1^4 (3x - x^2)^2 dx$</p> <p>_____</p> <p>(B) $\int_0^3 (3x - x^2)(4 - x) dx$</p> <p>_____</p> <p>(C) $\int_1^4 (3x - x^2)(4 - x) dx$</p> <p>_____</p> <p>(D) $\int_0^3 (3x - x^2)^2 dx$</p> <p>_____</p> <p>Answer Choice B</p>
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Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- 2. Reason abstractly and quantitatively.**
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics.**
- 5. Use appropriate tools strategically.**
- 6. Attend to precision.**
- 7. Look for and make use of structure.**
- 8. Look for and express regularity in repeated reasoning.**

Assessments (Formative)

Assessments (Summative)

To show evidence of meeting the standard/s, students will successfully engage within:		To show evidence of meeting the standard/s, students will successfully complete:	
<p><u>Formative Assessment:</u></p> <ul style="list-style-type: none"> ● Entry and Exit Slips ● Quizzes ● Self Assessments ● Focus Packets 		<p><u>Benchmarks:</u></p> <ul style="list-style-type: none"> ● Chapter Tests ● Projects <p><u>Summative Assessments:</u></p> <ul style="list-style-type: none"> ● District assessments 	
Differentiated Student Access to Content: Teaching and Learning Resources/Materials			
Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core Resources
<p>online albert resource online achievethecore resource online learnzillion resource online khan academy resource online desmos resource online edulastic resource</p>	<p>Reteaching worksheets Skill building workbook Math manipulatives Leveled practice worksheets</p>	<p>Dictionary for native language Video tutorial in native language Success for English Learners worksheets Leveled Strategies for English Learners Linguistic Support</p>	<p>Enrichment worksheets Art of Problem Solving Leveled assessments</p>
Supplemental Resources			
<ul style="list-style-type: none"> ● Technology: Chromebooks, Graphing Calculators, Smartboards, ● Other: Zoom and Google Meets, Schoology, Google Classroom 			

**Differentiated Student Access to Content:
Recommended *Strategies & Techniques***

Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core Resources
<p>Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat</p>	<p>Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.</p>	<p>Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.</p>	<p>Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related</p>