

October 28

How is finding the volume of a given object different from finding the area of a given region?

(Include differences in the question as well as differences in the answer.)



October 28

Students will verbally explain how to find the volume by slicing

(using the words:  
cross-section, area, dimensions, slice...)



## Calculus Project

### Volumes of Solids with Known Cross-Section

For this project, you will make a physical model of a solid with a known cross section on a base with a standard function. The following guidelines apply:

- Use two non-linear functions, one of which is not a parabola, square root, or absolute value.  
(Note: This is a requirement for the upper and lower functions for any given section if using a piece-wise function.)
  - You may use a piece-wise function for the upper or lower functions, but not both
  - "basic function" will not earn the same points as functions with two or more transformations
- The cross section can be any shape except a square – more points will be awarded for non-basic shapes.  
Basic shapes include rectangles with a constant height (or base), trapezoids with height of 1 or 2, isosceles triangles
- The materials should be about 0.25" thick.
- Your model must be at least 6 inches long and there must be at least 24 laminations.
- Every one unit on the graph is equal to one inch on your model.

Your final project and presentation must include the following information:

- The functions clearly identified.
- An explanation of what the cross section looks like and how to determine the dimensions of your cross-section.
- The computed volumes for each slice using a Riemann Sum.  
(on your table show: y-value for each function, computed necessary dimensions, computed area, computed volume)
- The total volume of the slices in your model.
- The theoretical volume as defined by a definite integral. You may evaluate the integral using your calculator.
- Combine everything with a common theme.

Due Dates:

Nov 5<sup>th</sup>  
Nov 19<sup>th</sup>

- {
- the functions you are using
  - the computed volume for each slice using a Riemann Sum.
  - final project


Projects showing extra effort and performance can earn extra-credit.

\* If working with a partner each of you must use 2 different functions, but you may combine your presentation for one theme. \*

Name: \_\_\_\_\_

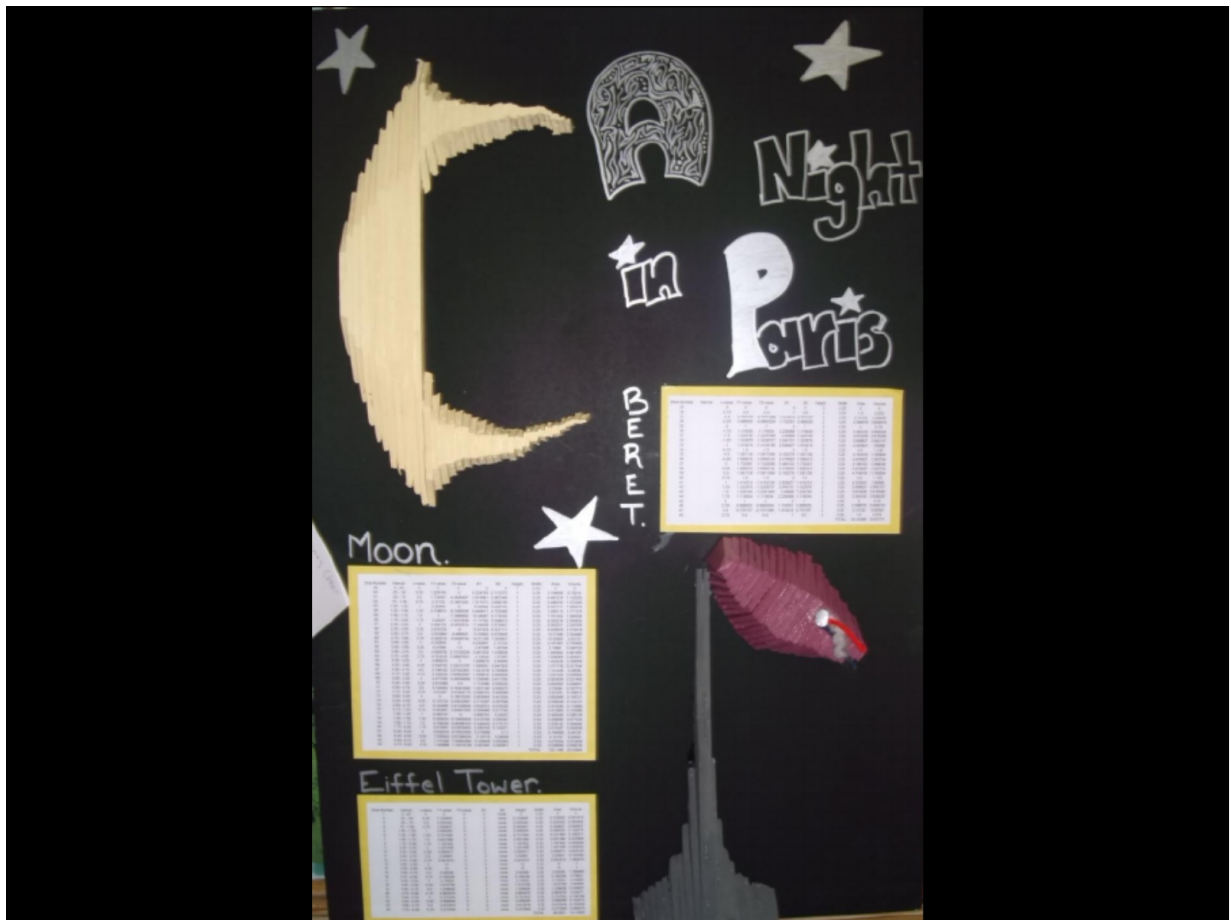
### Volume Scoring Rubric

Projects showing extra effort and performance can earn extra-credit.

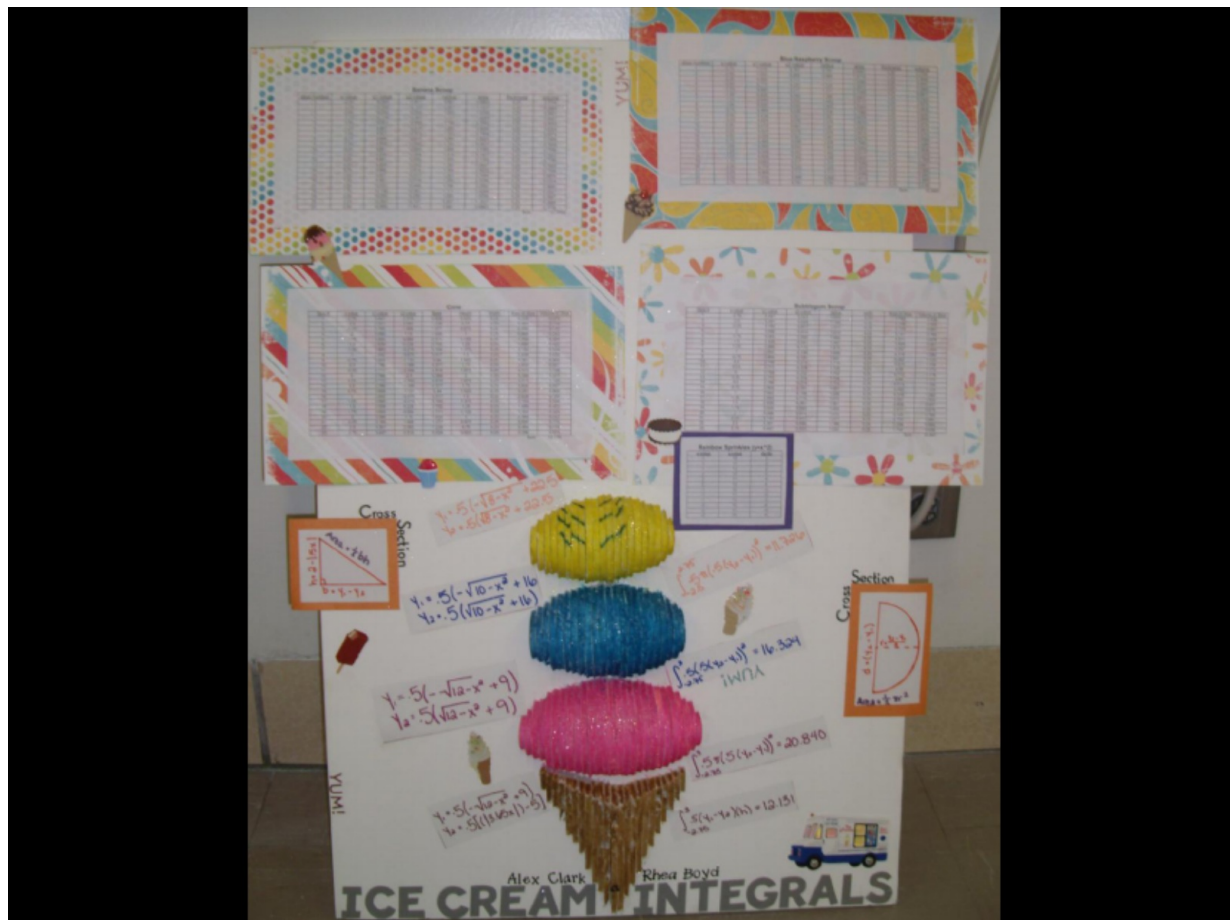
	4	3	2	1	0
Calculations	At least 90% of the calculations are correct	At least 70% of the calculations are correct	At least 50% of the calculations are correct	Less than 50% of the calculations are correct	
Description and difficulty of the functions  (With respect to the upper and lower functions that bound the region) 	Neither function is linear and at least one function is not a parabola, square root, or absolute value.  The two functions come from different families  The functions are considered difficult (parent functions with at least two transformations)	Neither function is linear and at least one function is not a parabola, square root or absolute value.  The functions are considered relatively simple (one or less transformations) <b>OR</b> Both functions come from the same family	One function is linear or both functions are a parabola, square root or absolute value.	Both functions are linear.	One function is a constant.
Description and difficulty of the cross section	The cross section is not a basic shape (rectangle, isosceles right triangle, circle, etc.) <b>AND</b> An accurate explanation of the cross section is given	The cross section is basic shape other than a square <b>AND</b> An accurate explanation of the cross section is not given <b>OR</b> The cross section is not a basic shape <b>BUT</b> An accurate explanation of the cross section is not given	The cross section is a square <b>AND</b> An accurate explanation of the cross section is given <b>OR</b> The cross section is basic shape other than a square (rectangle, isosceles triangle, circle, etc.) <b>BUT</b> An accurate explanation of the cross section is not given <b>OR</b> There is no description of the cross-section	The cross section is a square <b>BUT</b> an accurate explanation of the cross section is not given	

Computed Volume of for each slice using a Reimann Sum and total volume	<p>The volume for each slice is computed accurately  <b>AND</b>  The total volume of the slices is correct  <b>AND</b>  The table includes all necessary dimensions</p>	<p>The table includes all necessary dimensions  <b>AND</b>  At least 80% of the volumes for each slice are computed accurately  <b>OR</b>  The volume for each slice is computed accurately, but the total volume is incorrect.</p>	<p>The table includes all necessary dimensions  <b>AND</b>  At least 50% of the volumes for each slice are computed accurately  <b>OR</b>  All necessary dimensions are not included  <b>AND</b>  At least 80% of the volumes for each slice are computed accurately</p>	<p>All necessary dimensions are not included  <b>AND</b>  At least 50% of the volumes for each slice are computed accurately  <b>OR</b>  The table includes all necessary dimensions  <b>AND</b>  Less than 50% of the volumes for each slice are computed accurately</p>	<p>Less than 50% of the volumes for each slice are computed accurately</p>
The theoretical volume as defined by the definite integral	<p>The integral is set up and evaluated correctly.    The evaluated integral is relatively close to the total volume of the slices</p>	<p>The integral is set up correctly, but with some minor errors.    The evaluated integral is relatively close to the total volume of the slices</p>	<p>The integral is not set up correctly.  <b>OR</b>  The integral is not evaluated correctly.</p>	<p>The integral is not set up or evaluated correctly.</p>	<p>There is no definite integral.</p>
Over-all appearance	<p>All necessary items are included.  The project has at least 24 laminations.  The slices are accurately cut and placed.  All calculations are clear  The project has a theme</p>	<p>All necessary items are included  The project is easy to read, but there is no theme.  The project has at least 24 laminations, but they may not be accurate.</p>	<p>Less than 50% of the necessary items are included  The project is hard to read.  The project has less than 24 laminations.</p>	<p>Less than 50% of the necessary items are included  The project is hard to read.  The project has less than 24 laminations.</p>	









Use Excel to find the actual volume of your solid. (your table)

Use Calculus to find the theoretical volume of your solid. (integrals)