

AP[®] Calculus

Area & Volume

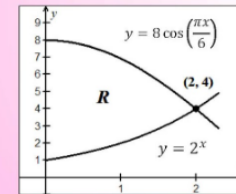
Three Truths & a Lie



4.

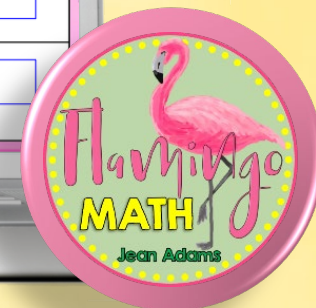
Three Truths and a Lie

The graphs of the functions $y = 2^x$ and $y = 8 \cos\left(\frac{\pi x}{6}\right)$ are shown at right. Let R be the region enclosed by the graphs as shown. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.

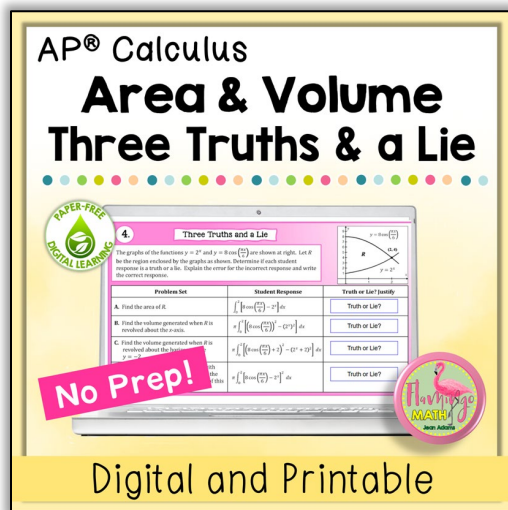


Problem Set	Student Response	Truth or Lie? Justify
A. Find the area of R .	$\int_0^2 \left[8 \cos\left(\frac{\pi x}{6}\right) - 2^x \right] dx$	Truth or Lie?
B. Find the volume generated when R is revolved about the x -axis.	$\pi \int_0^2 \left[\left(8 \cos\left(\frac{\pi x}{6}\right) \right)^2 - (2^x)^2 \right] dx$	Truth or Lie?
C. Find the volume generated when R is revolved about the horizontal line $y = -2$.	$\pi \int_0^2 \left[\left(8 \cos\left(\frac{\pi x}{6}\right) + 2 \right)^2 - (2^x + 2)^2 \right] dx$	Truth or Lie?
D. Find the volume generated when R is revolved about the vertical line $x = 2$.	$\pi \int_0^2 \left[8 \cos\left(\frac{\pi x}{6}\right) - 2^x \right]^2 dx$	Truth or Lie?

No Prep!



Digital and Printable



Area & Volume “Three Truths & a Lie” for Google Slides™

This activity is designed to help your AP Calculus students review key concepts at the end of the unit on **Applications of Integration**. There are 6 prompts for students to determine where the mistake occurs and then correct the set up.

KEY CONCEPTS/TOPICS:

- Topic 8.4 Finding the Area Between Curves Expressed as Functions of x
- Topic 8.5 Finding the Area Between Curves Expressed as Functions of y
- Topic 8.6 Finding the Area Between Curves That Intersect at More Than Two Points
- Topic 8.7 Volumes with Cross Sections: Squares and Rectangles
- Topic 8.8 Volumes with Cross Sections: Triangles and Semicircles
- Topic 8.9 Volume with Disc Method: Revolving Around the x - or y -Axis
- Topic 8.10 Volume with Disc Method: Revolving Around Other Axes
- Topic 8.11 Volume with Washer Method: Revolving Around the x - or y -Axis
- Topic 8.12 Volume with Washer Method: Revolving Around Other Axes

GENERAL DIRECTIONS:

This activity contains 6 prompts with four parts. Three of the student responses are true, one is incorrect (lie). When you discover the incorrect student set-up, write the correct answer in the text box provided and follow your teacher's instructions for submitting.

NOTE: You and your students must have a free Google account in order to access and interact with the activity. It is not necessary to use Google Classroom to use this resource.

This **GOOGLE SLIDES™** activity is **NOT EDITABLE** in order to protect the copyright for clipart used in the resource.





Three Truths & a Lie!

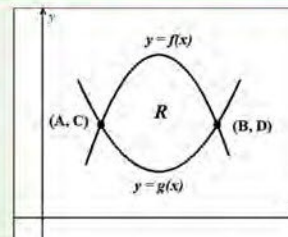
Digital Area & Volume Activity

Directions: This activity contains 6 problems. Student responses are true or false. Discover the incorrect student response in the text box provided for submitting.

1.

Three Truths and a Lie

The graphs of the functions f and g are shown at right. Let R be the region bounded by the graphs of f and g . Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.

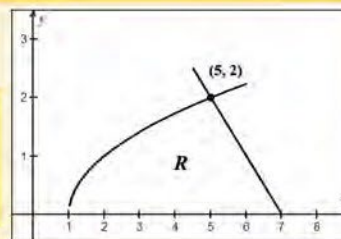


Problem Set	Student Response	Truth or Lie? Justify
A. Find the area of R	$\int_A^B [f(x) - g(x)] dx$	

2.

Three Truths and a Lie

Let R be the region in the first quadrant enclosed by the graphs of $y = \sqrt{x-1}$, $x + y = 7$ and the x -axis as shown at right. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.



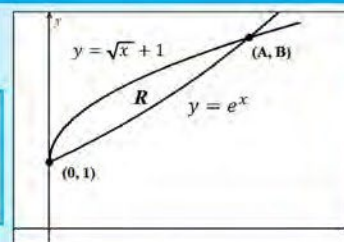
Problem Set	Student Response	Truth or Lie? Justify
A. Find the area of R	$\int_0^2 [(7-y) - (y^2+1)] dy$	
B. Find the volume generated when R is revolved about the y -axis.	$\pi \int_0^2 [(7-y)^2 - (y^2+1)^2] dy$	
C. The region R is the base of a solid with each cross section perpendicular to the y -axis is a square. Find the volume of this solid.	$\int_1^7 [(7-x) - (\sqrt{x-1})]^2 dx$	
D. Find the volume of the solid generated when R is revolved about the horizontal line $y = 2$.	$\pi \int_1^5 (2-0)^2 - (2-\sqrt{x-1})^2 dx$ $+ \pi \int_5^7 (2-0)^2 - (2-(7-x))^2 dx$	



3.

Three Truths and a Lie

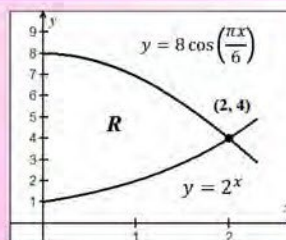
The graphs of the functions $y = e^x$ and $y = \sqrt{x} + 1$ are shown at right. Let R be the region enclosed by the graphs as shown. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.



4.

Three Truths and a Lie

The graphs of the functions $y = 2^x$ and $y = 8 \cos\left(\frac{\pi x}{6}\right)$ are shown at right. Let R be the region enclosed by the graphs as shown. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.



Student Response

Truth or Lie? Justify

$$-1)^2] dy$$

$$)^2 - (e^x)^2] dx$$

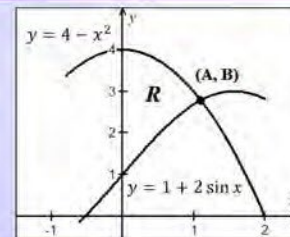
$$- ((y-1)^2)^2] dy$$

Problem Set	Student Response	Truth or Lie? Justify
A. Find the area of R .	$\int_0^2 \left[8 \cos\left(\frac{\pi x}{6}\right) - 2^x \right] dx$	
B. Find the volume generated when R is revolved about the x -axis.	$\pi \int_0^2 \left[\left(8 \cos\left(\frac{\pi x}{6}\right) \right)^2 - 2^{2x} \right] dx$	
C.		

5.

Three Truths and a Lie

The graphs of the functions $y = 4 - x^2$ and $y = 1 + 2 \sin x$ are shown at right. Let R be the regions enclosed by the graphs as shown. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.



Student Response

Truth or Lie? Justify

$$- (1 + 2 \sin x)] dx$$

$$)^2 - (1 + 2 \sin x)^2] dx$$

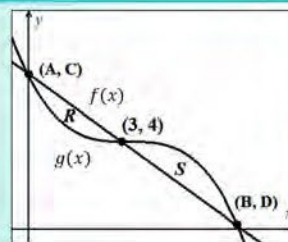
$$^2) - (1 + 2 \sin x)^2] dx$$

$$2 \sin x)^2 - [5 - (4 - x^2)]^2 dx$$

6.

Three Truths and a Lie

The graphs of the functions f and g are shown at right. Let R and S be the regions bounded by the graphs of f and g as shown. Determine if each student response is a truth or a lie. Explain the error for the incorrect response and write the correct response.



Problem Set	Student Response	Truth or Lie? Justify
A. Find the area of R .	$\int_A^3 [(f(x) - g(x))] dx$	
B. Find the volume generated when R is revolved about the horizontal line $y = -1$.	$\pi \int_A^3 [(f(x) - 1)^2 - (g(x) - 1)^2] dx$	
C. Find the volume generated when S is revolved about the vertical line $x = 3$. Find the volume of this solid.	$\pi \int_3^B [(g(y) - 3)^2 - (f(y) - 3)^2] dy$	
D. The region S is the base of a solid with each cross section perpendicular to the x -axis is a semicircle. Find the volume of this solid.	$\frac{\pi}{8} \int_3^B [g(x) - f(x)]^2 dx$	

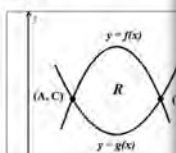
Three Truths and a Lie

Name _____

Directions: For each problem set determine if each student response is a truth or a lie. Explain error for the incorrect response "the lie" and write the correct response.

Problem #1:

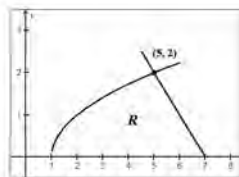
The graphs of the functions f and g are shown at right. Let R be the region bounded by the graphs of f and g .



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_A^0 [f(x) - g(x)] dx$	
B. Find the volume generated when R is revolved about the horizontal line $y = 5$.	
$\pi \int_A^0 [5 - g(x)]^2 - [5 - f(x)]^2 dx$	

Problem #2:

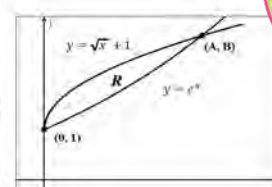
Let R be the region in the first quadrant enclosed by the graphs of $y = \sqrt{x-1}$, $x + y = 7$ and the x -axis as shown at right.



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_0^2 [(7-y) - (y^2+1)] dy$	
B. Find the volume generated when R is revolved about the y -axis.	
$\pi \int_0^2 [(7-y)^2 - (y^2+1)^2] dy$	
C. The region R is the base of a solid with each cross section perpendicular to the y -axis is a square. Find the volume of this solid.	

Problem #3:

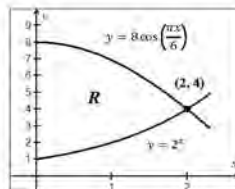
The graphs of the functions $y = e^x$ and $y = \sqrt{x} + 1$ are shown at right. Let R be the region enclosed by the graphs as shown.



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_0^A [\ln y - (y-1)^2] dy$	
B. Find the volume generated when R is revolved about the x -axis.	
$\pi \int_0^A [(\sqrt{x}+1)^2 - (e^x)^2] dx$	

Problem #4:

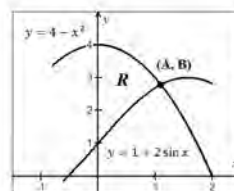
The graphs of the functions $y = 2^x$ and $y = 8 \cos(\frac{\pi x}{6})$ are shown at right. Let R be the region enclosed by the graphs as shown.



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_0^2 [8 \cos(\frac{\pi x}{6}) - 2^x] dx$	
B. Find the volume generated when R is revolved about the x -axis.	
$\pi \int_0^2 \left[\left(8 \cos\left(\frac{\pi x}{6}\right) \right)^2 - (2^x)^2 \right] dx$	
C. Find the volume generated when R is revolved about the horizontal line $y = -2$.	
$\pi \int_0^2 \left[\left(8 \cos\left(\frac{\pi x}{6}\right) + 2 \right)^2 - (2^x + 2)^2 \right] dx$	
D. The region R is the base of a solid with each cross section perpendicular to the x -axis is a square. Find the volume of this solid.	
$\pi \int_0^2 \left[8 \cos\left(\frac{\pi x}{6}\right) - 2^x \right]^2 dx$	

Problem #5:

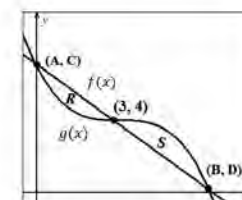
The graphs of the functions $y = 4 - x^2$ and $y = 1 + 2 \sin x$ are shown at right. Let R be the regions enclosed by the graphs as shown.



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_0^A [(4-x^2) - (1+2 \sin x)] dx$	
B. Find the volume generated when R is revolved about the y -axis.	
$\pi \int_0^A [(4-x^2)^2 - (1+2 \sin x)^2] dx$	
C. Find the volume generated when R is revolved about the horizontal line $y = 5$.	
$\pi \int_0^A [5 - (1+2 \sin x)]^2 - [5 - (4-x^2)]^2 dx$	
D. The region R is the base of a solid with each cross section perpendicular to the x -axis is an isosceles right triangle with a leg as the base. Find the volume of this solid.	
$\frac{\sqrt{3}}{2} \int_0^A [(4-x^2) - (1+2 \sin x)]^2 dx$	

Problem #6:

The graphs of the functions f and g are shown at right. Let R and S be the regions bounded by the graphs of f and g as shown.



Student Response	Truth or Lie? Justify
A. Find the area of R .	
$\int_A^3 [f(x) - g(x)] dx$	
B. Find the volume generated when R is revolved about the horizontal line $y = -1$.	
$\pi \int_A^3 [(f(x)-1)^2 - (g(x)-1)^2] dx$	
C. Find the volume generated when S is revolved about the vertical line $x = 3$. Find the volume of this solid.	
$\pi \int_3^B [(g(x)-3)^2 - (f(x)-3)^2] dy$	
D. The region S is the base of a solid with each cross section perpendicular to the x -axis is a semicircle. Find the volume of this solid.	
$\frac{\pi}{6} \int_3^B [g(x) - f(x)]^2 dx$	