Name:________________________________ Date:__________________

Area, Volume and Arc-length Review Problems.

For full credit, show all work that leads to your answer. All answers should be expressed in their simplest form.

CALCULATOR INACTIVE

1. Let R be the region in the first quadrant bounded by the graph of $y = 3x - x^2$and the x-axis. A solid is generated when *R* is revolved about the vertical line $x = -1$. Set up, but do not evaluate, the definite integral that gives the volume of this solid.

2. Let R be the region bounded by the x-axis, the graph of $x = y^2 + 2$, and the line $x = 4$. Set up, but do not evaluate, the definite integral that gives the area of this region.

3. Let *f* and *g* be the functions given by $f(x) = e^x$ and $g(x) = \frac{1}{x}$. Which of the following gives the area of the region enclosed by the graphs of *f* and *g* between x = 1 and x = 2?

(A)$e^2 - e - ln2$ (B) $ln2 - e^2 + e$ (C) $e^2 - \frac{1}{2}$ (D) $e^2 - e - \frac{1}{2}$ (E) $\frac{1}{e} - ln2$

4. Let R be the region in the first quadrant enclosed by the graphs of $y = 2x$ and $y = x^2$. A solid has the base of region R. For this solid, the cross-sections perpendicular to the y=axis are squares. Find the volume of this solid.

5. Let R be a region in the first quadrant under the graph of $y = \frac{1}{\sqrt{x}}$ for $4 \leq x \leq 9$. If the line $x = k$ divides the region *R* into two regions of equal area, what is the value of *k*?

CALCULATOR ACTIVE

For full credit, show all work that leads to your answer. All answer must be given as a decimal approximation (no pi).

1. Let R be the region enclosed by the graphs of $y = \ln(x^2 + 1)$ and $y = cosx$. The base of a solid is the region R. Each cross section of the solid perpendicular to the x-axis is an equilateral triangle. Find the volume of the solid.

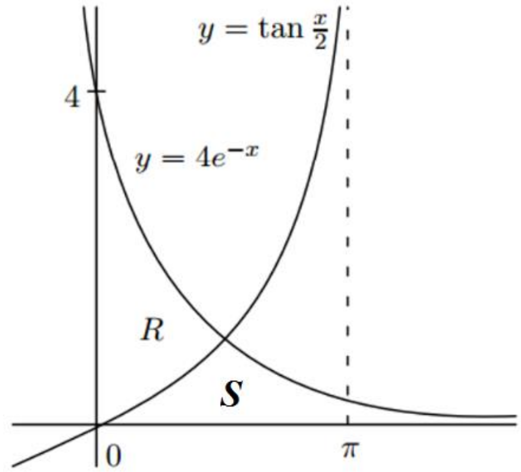
2. Let R be the region in the xy-plane between the graphs of $y = e^x$ and $y = e^{-x}$ from x = 0 to x = 2.

   a. Find the volume of the solid generated when R is revolved about the line y = -3
   b. Using the same region in #2, find the volume of the solid generated when R is revolved about the y-axis.

3. A region R is enclosed by the curves $x = y^2 - 2$, y = lnx, and bounded above by y = 1. Find the area of R.

4. Find the length of the curve $y = \sqrt[3]{x}$ from x = -2 to x = 2.

5. Let R be the region in the first quadrant enclosed by the graphs of $y = 4e^{-x}$, $y = tan\left(\frac{x}{2}\right)$, the line x = π, and the x-axis as shown in the figure below.

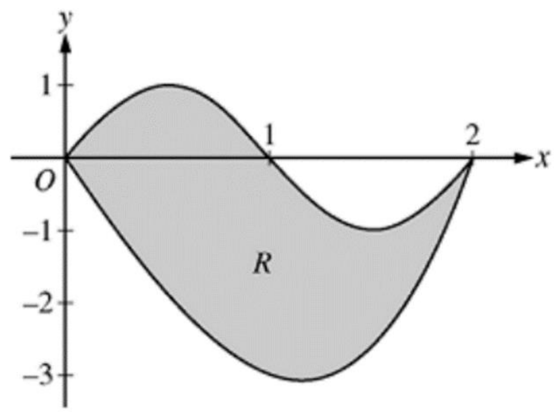


a. Find the area of region S.

b. Let R be the region in the first quadrant enclosed by the graphs of $y = 4e^{-x}$, $y = tan\left(\frac{x}{2}\right)$, and the y-axis. The region R is the base of a solid, each cross-section perpendicular to the x-axis is a semicircle. Find the volume of this solid.

6. Let R be the region bounded by the graphs of $y = \sin(\pi x)$ and $y = x^3 - 4x$ as shown below.

a. Find the volume of the solid generated by rotating this region about y = 4.



b. The horizontal line y = -2 splits the region R into two parts. Write, but do not evaluate, and integral expression for the area of the part of R this is below this horizontal line.

7. The length of a curve from x = 1 to x = 4 is given by $\int_1^4 \sqrt{1+9x^4}dx$. If the curve contains the point (1,6), which of the following could be an equation for this curve?

(A) $y = 3 + 3x^2$ (B) $y = 5 + x^3$ (C) $y = 6 + x^3$

(D) $y = 6 - x^3$ (E) $y = \frac{16}{5} + x + \frac{9}{5}x^3$

8. Let R be the region in the first quadrant bounded by the y-axis and the graphs $y = 4x - x^3 + 1$ and $y = \frac{3}{4}x$. Find the perimeter of region R. Show all steps to get your answer.

9. Find the volume of the region enclosed by the function $y^2 = x + 4$ and $y = x - 2$ when rotated around the axis x = 10.