Unit 7 Outline – Volume

Wednesday 11/20	**Today's Topic: Area** - Using the Graphing Calculator

In-Class Examples: A graphing calculator must be used for these problems. Find the area of the region(s) enclosed by the graphs of the given functions.

Ex. 1 $y = x^2$ and $y = x + 6$

Ex. 2 $y = e^{x^2} - 1$ and $y = 4x$

Ex. 3 $y = \sin(\pi x)$ and $y = x^3 - 4x$

AP Multiple Choice

What is the area of the region enclosed by the graphs of $y = e^x - 2$, $y = \sin x$, and $x = 0$?

(A) 0.239 (B) 0.506 (C) 0.745 (D) 2.340 (E) 3.472

What is the area of the region enclosed by the graphs of $y = \sqrt{4x - x^2}$ and $y = \frac{x}{2}$?

(A) 1.707 (B) 2.829 (C) 5.389 (D) 8.886 (E) 21.447

Homework: None

Thursday 11/21	**Today's Topic: Volumes by Cross Sections** - $V = \int_a^b$ Area of Cross Sections

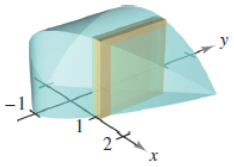
In-Class Examples:

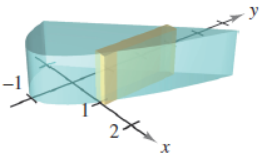
Ex. 1 ***Calculator Required*** Let *R* be the region in the first quadrant bounded by the graphs of $f(x) = \sin x$ and $g(x) = x^2 - 2x + 1$.

(a) Find the area of region *R*.
(b) Region *R* forms the base of a solid whose cross-sections are squares taken perpendicular to the *x*-axis. Find the volume of this solid.

Ex. 2 Let *R* be the region bounded by the graphs of $y = x + 1$ and $y = x^2 - 1$. Find the volume of the solid whose base is the region *R*, with the indicated cross sections taken perpendicular to the *x*-axis:

(a) Squares (b) Rectangles of height 1 (c) Semicircles





Homework: Worksheet 59

Friday 11/22	**Today's Topic Volumes by Cross Sections -** $V = \int_a^b$ Area of Cross Sections

In-Class Examples:

Find the volume of the solid whose base is the region in the first quadrant bounded by the graphs of $y = x^2$, $y = 1$ and the *y*-axis with the indicated cross sections taken perpendicular to the *x*-axis:

(a) Squares (b) Semicircles (c) Equilateral Triangles

AP Multiple Choice

The base of a solid is the region bounded by the *x*-axis and the graph of $y = \sqrt{1 - x^2}$. For the solid, each cross section perpendicular to the *x*-axis is a square. What is the volume of the solid?

(A) $\frac{2}{3}$ (B) $\frac{4}{3}$ (C) 2 (D) $\frac{2\pi}{3}$ (E) $\frac{4\pi}{3}$

Homework: Worksheet 60

	Today's Topic: Volumes of Solids Formed by Rotation (Disks and Washers)

Review: Let *R* be the region enclosed by the graphs of $y = \sqrt{x}$, $y = 0$, and $x = 4$.

(a) Find the area of region *R*.

(b) Region *R* forms the base of a solid. Cross-sections of this solid, taken perpendicular to the *x*-axis are squares. Find the volume of this solid.

In-Class Examples:

Ex. 1 Let *R* be the region enclosed by the graphs of $y = \sqrt{x}$, $y = 0$, and $x = 4$. Find the volume of the solid generated by revolving the region *R* about the *x*-axis.

Ex. 2 Let *R* be the region enclosed by the graphs of $y = \sqrt{x}$, $y = 0$, and $x = 4$. Find the volume of the solid generated by revolving the region *R* about the horizontal line $y = -3$.

Ex. 3 Let *R* be the region enclosed by the graphs of $y = \sqrt{x}$, $y = 0$, and $x = 4$. Find the volume of the solid generated by revolving the region *R* about the horizontal line $y = 2$.

Homework: None

Today's Topic: Volumes of Solids Formed by Rotation (Disks and Washers)

AP Multiple Choice

A vase has the shape obtained by revolving the curve $y = 2 + \sin x$ from $x = 0$ to $x = 5$ about the x-axis, where x and y are measured in inches. What is the volume, in cubic inches, of the vase?

(A) 10.716 (B) 25.501 (C) 33.666 (D) 71.113 (E) 80.115

Let R be the region bounded by the graphs of $y = e^x$, $y = e^3$, and $x = 0$. Which of the following gives the volume of the solid formed by revolving R about the line $y = -1$?

(A) $\pi\int_0^3 \left(e^3 - e^x + 1\right)^2 dx$

(B) $\pi\int_0^3 \left(e^3 - e^x - 1\right)^2 dx$

(C) $\pi\int_0^3 \left[\left(e^3 - e^x\right)^2 + 1\right] dx$

(D) $\pi\int_0^3 \left[\left(e^3 - e^x\right)^2 - 1\right] dx$

(E) $\pi\int_0^3 \left[\left(e^3 + 1\right)^2 - \left(e^x + 1\right)^2\right] dx$

Homework: Worksheet 61

Today's Topic: Volumes of Solids Formed by Rotation (Disks and Washers) – vertical line

In-Class Examples:

Ex. 1 Let R be the region enclosed by the graphs of $y = \sqrt{x}, y = 2$, and the y-axis. Find the volume of the solid generated by revolving the region R about the y-axis.

Ex. 2 Let R be the region in the first quadrant enclosed by the graphs of $y = x^2$ and $y = 4$. Find the volume of the solid generated by revolving the region R about the line $x = -2$.

AP Multiple Choice

What is the volume of the solid generated when the region bounded by the graph of $x = \sqrt{y - 2}$ and the lines $x = 0$ and $y = 5$ is revolved about the y-axis?

(A) 3.464 (B) 4.500 (C) 7.854 (D) 10.883 (E) 14.137

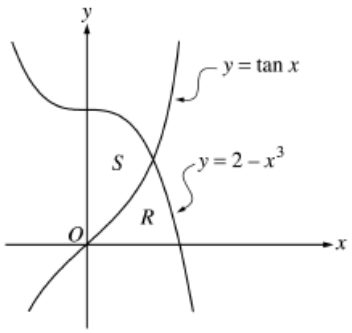
Homework: Worksheet 62

	Today's Topic: Area and Volume Review
In-Class Examples: None	
Homework: Worksheet 63	

Monday 12/9	**Today's Topic: Area and Volume – AP Questions**

In-Class Examples: Let R and S be the regions in the first quadrant shown in the figure at right. The region R is bounded by the x-axis and the graphs of $y = 2 - x^3$ and $y = \tan x$. The region S is bounded by the y-axis and the graphs of $y = 2 - x^3$ and $y = \tan x$.

(a) Find the area of S.
(b) Find the volume of the solid generated when S is rotated around the x-axis.
(c) The region S is the base of a solid whose cross-sections are squares perpendicular to the x-axis. Find the volume of this solid.
(d) Find the area of R.



Homework: Worksheet 64

Tuesday 12/10	**Today's Topic: Area and Volume Review**
In-Class Examples: None	
Homework: Worksheet 65	

Wednesday 12/11	**Today's Topic: Area and Volume Test**
In-Class Examples: None	
Homework:	