Math 152 - Worksheet 4

Section 6.3 - Solids of Revolution - Washer Method

Learning Problems

These problems should be completed on your own. If you need hints on solving a problem, there are some provided with each problem. These are provided on the following pages, with one 'level' of hint per page, with the earlier ones giving away less of the problem than the later ones. Try to work from the earlier hints to the later ones, as this will give you the practice you need to succeed in this class.

1. Find the volume of the solid of revolution obtained by revolving the graph of $y = \frac{6}{x^2}$ around the x-axis over the range $[1, 4]$.

2. Find the volume of the solid of revolution obtained by revolving the region enclosed between the graphs of $y = 3 - x$ and $y = x^2 - 3$ around the line $y = -5$.

3. Find the volume of the solid of revolution obtained by revolving the region in the first quadrant between the graph of $y = x^2 + 4$ and the line $y = 13$ around the x axis.

4. Find the volume of the solid of revolution obtained by revolving the region in the first quadrant between the graph of $y = x^2 + 4$ and the line $y = 13$ around the y axis.

5. Find the volume of the solid of revolution obtained by revolving the region in the first quadrant between the graph of $y = x^2 + 4$ and the line $y = 13$ around the line $x = -1$.

Submission Problems

1. Find the volume of the solid of revolution obtained by revolving the region between the graphs of $y = 2x$ and $y = x^2 - 4x$ around the line $y = -4$

2. Find the volume of the solid of revolution obtained by revolving the region between the graphs of $y = x^4 + 1$, $y = 1$ and $x = 2$ around the line $x = -1$.

Hint #1

1. Draw a picture of the region. What should the radius be for this region?
2. Sketch out a picture. Draw in the segment that is being rotated and try to set up the integral.
3. What is the segment being rotated? What are the inner and outer radii?
4. What is the segment being rotated? What are the inner and outer radii?
5. What is the segment being rotated? What are the inner and outer radii?

Hint #2

1. From the radius, what is the area of each cross section?
2. This is a washer method problem. What is the inner radius? What is the outer radius?
3. What should the bounds on the integral be?
4. What should the bounds on the integral be?
5. What should the bounds on the integral be?

Hint #3

1. The integral to find the volume is $\int_1^4 \pi \left(\frac{6}{x^2}\right)^2 \, dx$
2. What should the bounds be on the integral that you need to compute? (And how would you go about finding them?)
3. The integral should be
$$\pi \int_0^3 13^2 - (x^2+4)^2 \, dx$$
4. The integral should be
$$\pi \int_4^{13} (y-4) \, dy$$
5. The integral should be
$$\pi \int_4^{13} (\sqrt{y-4}+1)^2 - 1^2 \, dy$$

Hint #4

2. The integral is $\pi \int_{-3}^{2} (3 - x + 5)^2 - (x^2 - 3 + 5)^2 \, dx$

Answers

1. $\frac{189}{16}\pi$
2. 250π
3. $\frac{1692}{5}\pi$
4. $\frac{81}{2}\pi$
5. $\frac{153}{2}\pi$