Function Revolution Exploration Questions

When calculating the volume of a solid of revolution, you think of splitting the solid into many disks or washers, calculating their volume, then summing over them all. As you increase the number of partitions, you get closer and closer to the value of the integral. This is similar to Riemann sums approaching integration.

To start, we will revolve a function around the x-axis.

Disk Method:

1. What is the formula for the volume of a disk? Hint: think about the area of a circle and multiply by height.

2. If we substitute $f(x)$ for the radius and dx for the height, then integrate, we will get the formula for the volume of a solid of revolution using the disk method. Write the integral expression.

3. What is the volume of the solid obtained by revolving the function $f(x) = -\frac{1}{5}x + 4$ from 0 to 7 about the x-axis? Use the applet to check your answer.

4. How will the radius of the disks change if we revolve the function around the line y=-2 instead? Hint: How far is it from the function to the line y=-2?

5. What is the volume of the solid obtained by revolving the function $f(x) = -\frac{1}{5}x + 4$ from $x = 0$ to $x = 7$ about the line $y = -2$?

Washer Method

A washer is basically a disk that has a hole in the middle. Thus, a washer is thought to have an outer radius and an inner radius. Each radius is a separate function.

6. What is the formula for the volume of a washer? Hint: Calculate the volume of a disk with the outer radius then subtract the volume of a disk with the inner radius.

7. After substituting $f(x)$ for the outer radius, $g(x)$ for the inner radius, and dx for the height, and integrating, what integral expression will you get for the volume of a solid of revolution using the washer method?

8. What is the volume of the solid obtained by revolving the equations $f(x) = -\frac{1}{5}x + 4$ and $g(x) = \frac{1}{3}x$ from 0 to 7 around the x-axis? Use the applet to check your answer.

9. In the **Revolve** box in the activity, click the button next to **across x=** to indicate that you want to revolve the function around a vertical line. How does the **Functions** box change when you make this selection? What does this mean for the functions that are being entered?