

19 February 2015

The following questions are in the context of volumes of revolution.

1. Describe the following terms in words **and** pictures. Make sure to label the pictures.
 - (a) slice, disk, washer
 - (b) area of a circle
 - (c) shell, cylinder
 - (d) surface area of a cylinder

2. Let $f(x) = \sin(x)$, $g(x) = 4x^2/\pi^2$, $h(x) = 0$, and $k(y) = \pi/2$. Draw pictures and give the dimensions of:
 - (a) the slice at $\pi/6$ when rotating the area between f , h , and k around the x -axis;
 - (b) the slice at $\pi/4$ when rotating the area between f and g around the x -axis;
 - (c) the slice at $\pi/3$ when rotating the area between f and g around $y = 3$;
 - (d) the shell at $1/4$ when rotating the area between f , h , and k around the x -axis;
 - (e) the shell at $1/2$ when rotating the area between f and g around the x -axis;
 - (f) the shell at $4/5$ when rotating the area between f and g around $y = 3$;
 - (g) the slice at $1/4$ when rotating the area between f , h and k around the y -axis;
 - (h) the slice at $1/2$ when rotating the area between f and g around the y -axis;
 - (i) the slice at $4/5$ when rotating the area between f and g around $x = -1$;
 - (j) the shell at $\pi/6$ when rotating the area between f , h and k around the y -axis;
 - (k) the shell at $\pi/4$ when rotating the area between f and g around the y -axis;
 - (l) the shell at $\pi/3$ when rotating the area between f and g around $x = -1$.

3. Let V be the volume of revolution attained by rotating the area in the first quadrant bounded by $y = 3x$, $y = 3x - 1$, and $x = 5$ around the x -axis. Write the integrals (do not evaluate them) expressing V , in slices **and** shells.

The last question requires trigonometric substitution.

4. Find the exact values of the following definite integrals.

(a)
$$\int_1^{\sqrt{3}} \frac{t^4}{1+t^2} dt$$

(b)
$$\int_0^4 \sqrt{4x - x^2} dx$$