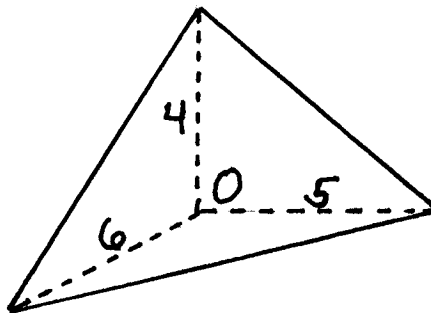


Math 21B  
 Kouba  
 Discussion Sheet 4

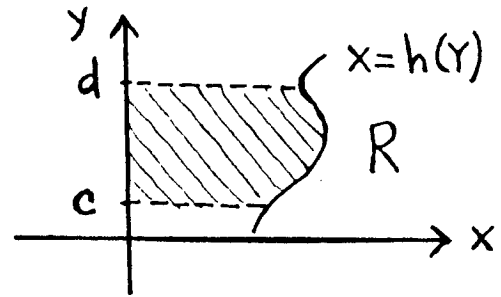
- 1.) The flat base of a solid lies in the region bounded by the graphs of  $y = x^2$ ,  $y = 0$ , and  $x = 2$ . Set up but do not evaluate an integral which represents the volume of the solid if cross-sections taken perpendicular to the x-axis are
  - a.) squares.
  - b.) semi-circles.
  - c.) equilateral triangles.
- 2.) The flat base of a solid lies in the region bounded by the graphs of  $y = \sqrt{x}$ ,  $x = 0$  and  $y = 4$ . Set up but do not evaluate an integral which represents the volume of the solid if cross-sections taken perpendicular to the x-axis are
  - a.) rectangles of height 10.
  - b.) right triangles (leg down) of perimeter 6.
- 3.) Consider the region bounded by the graphs of  $y = \ln x$ ,  $y = 0$ , and  $x = e$ . Use the Disc Method to set up (but not evaluate) integrals which represent the volume of the solid formed by revolving the region about the
  - a.) x-axis.
  - b.) line  $y = 5$ .
  - c.) y-axis
  - d.) line  $x = -2$ .
- 4.) A drill of radius 3 inches bores a hole through a hemispherical solid of radius 5 inches. If the drill bores a hole perpendicularly to and symmetrically about the center of the flat circular base, what is the volume of what remains of the hemisphere ?
- 5.) Use the Disc Method to derive the equation for the volume of a sphere of radius  $r$ .
- 6.) Determine the volume of the given four-sided block. Assume that the three triangles meeting at point O are right triangles.



- 7.) Consider region R bounded by the graphs of  $y = 3x$ ,  $y = x$ , and  $x = 1$ .
  - a.) Compute the area of R.
  - b.) Use the DISC METHOD (Set up only.) to find the volume of the solid formed by revolving R about the
    - i.) x-axis.
    - ii.) y-axis.
    - iii.) line  $y = 4$ .
    - iv.) line  $x = -1$ .
  - c.) Repeat part b.) using the SHELL METHOD.
- 8.) Consider region R bounded by the graphs of  $x = y^2$  and  $x = y^3 - y^2$ .
  - a.) Find the area of R.

b.) Use the Disc Method or the Shell Method (Pick the more convenient method and set up only.) to find the volume of the solid formed by revolving R about the  
i.) x-axis.      ii.) line  $x = -2$ .

9.) Consider the region R given in the diagram at right.  
If the volume of the solid formed by revolving R about the y-axis is  $10\pi$  and the volume of the solid formed by revolving R about the line  $x = -1$  is  $20\pi$ , what is the area of R ?



THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

10.) Two bicyclists are twelve miles apart. They begin riding toward each other, one pedaling at 4 mph and the other at 2 mph. At the same time a bumblebee begins flying back and forth between the riders at a constant speed of 10 mph. How far does the bumblebee travel by the time the riders meet ?