Calculus Section 7.3 Volume by Shells  
-Find the volume of a solid of revolution using the shell method  
-Compare the uses of the disk method and the shell method

Homework: page 462 #’s 3, 5, 7, 23-26

The shell method is an alternative method for finding the volume of a solid of revolution. The shell method uses cylindrical shells to evaluate the volume of a rotation. The shell method is particularly useful when trying to rotate functions that cannot be solved for x around a vertical axis of revolution (i.e. y = x3 + 2x2 – 4x).

The area of a cylinder is A = 2πrh, where r is perpendicular to  
the axis of revolution and h is the length of the cylinder.

**The Shell Method**To find the volume of a solid of revolution with the shell method, use one of the following:

Horizontal Axis of Revolution Vertical Axis of Revolution

r(x)

h(x)

a

b

r(x)

h(x)

c

d

The limits of integration you use are flipped from the cross-section/disk/washer method. Use the y-values as limits of integration for a horizontal axis of revolution. Use x-values for a vertical axis of revolution.

**Example)**Find the volume of the solid of revolution formed by revolving the region bounded by y = x – x3, the x-axis, the y-axis, and x = 1 about the y-axis.

**Example)**Find the volume of the solid of revolution formed by revolving the region bounded by , the x-axis, the y-axis, and y = 1 about the x-axis.

**Example)**Find the volume of the solid formed by revolving the region bounded by the graphs of y = x3 + x + 1, y = 1, and x = 1 about the line x = 2.