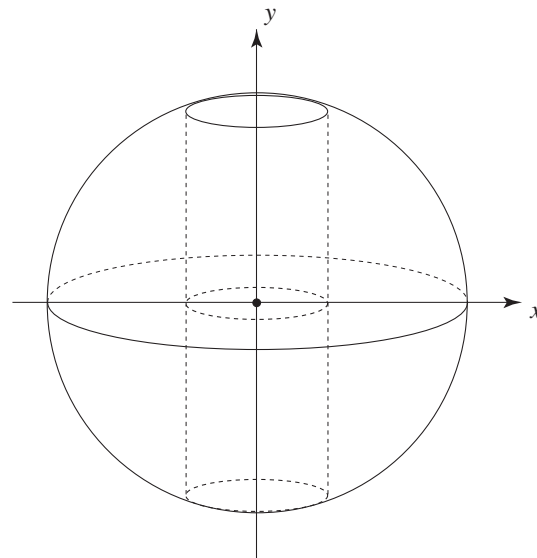
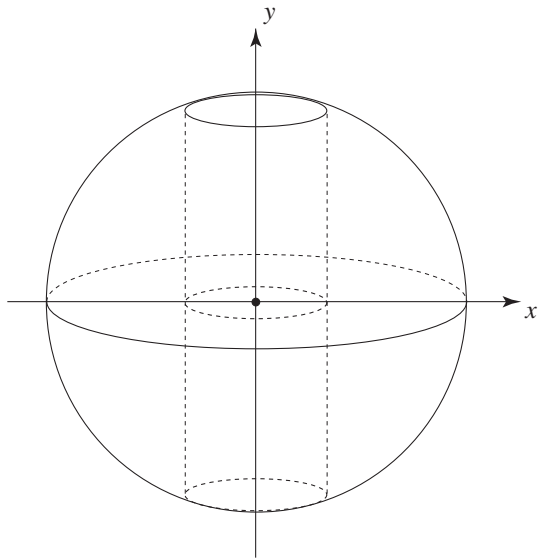


Quiz

Name

Depicted below are identical spheres of radius 3 with a vertical cylindrical holes of radius 1. Two xy -coordinate planes depicting the cross sections of the sphere and the cylinder are placed as shown. Express the volume of the sphere minus the hole as a definite integral in two ways:



1. With the “shell” method, by revolving a vertical area element around the y -axis. Start by drawing a vertical area element (into the sphere on the left) and determine its upper and lower limits. Let dx be its (thin) width. Then find an expression for the volume of revolution that this element generates. Put the definite integral into the box.

2. With the “disc” method, by revolving a horizontal area element around the y -axis. Again start by drawing a horizontal area element into the sphere on the right) and determine its limits. Let dy be its (thin) thickness. Then find an expression for the volume of revolution that this element generates. Put the definite integral into the box.