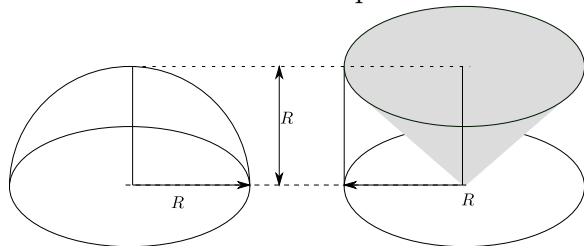


**Name:** \_\_\_\_\_ **Section:** 201 (starts at 08:00)  
 202 (starts at 09:35)

Justify your answers.

Consider a half-sphere of radius  $R$ , and a solid cylinder of radius  $R$  and height  $R$ , out of which a solid cone with apex at the center of the bottom face has been removed.



We will compute the volume of the sphere by looking to cross-sections parallel to the bases of these solids.

- (2 points) Find the cross-section area of the sphere at height  $h$  from the base (as a function of  $h$ ).

**Answer:** \_\_\_\_\_

- (2 points) Find the cross-section area of the second solid at height  $h$  (as a function of  $h$ ).

**Answer:** \_\_\_\_\_

- (1 point) What is the volume of the second solid?

**Answer:** \_\_\_\_\_

- (1 point) Apply Cavalieri's principle to get the volume of the half-sphere, as a function of  $R$ .

**Answer:** \_\_\_\_\_

5. (4 points) Find the volume of the sphere of radius 1 using the method of cylindrical shells.

**Answer:** \_\_\_\_\_