

Homework 3

Homework: Find the volume of a solid cone whose base has area A , and whose vertex is distance h away from the plane of the base. Express your answer in terms of A and h . Justify all steps.

Clarification: In this problem, you *cannot* assume that the base is round. It can be any shape bounded by a continuous curve.

If you are stuck, try solving the problem for the following base shapes:

- circle of radius R ;
- square with side a ;
- rectangle with sides a, b ;
- equilateral triangle with side a .

Can you get the answer for *any* shape?

Hint: try getting the volume by slicing with planes parallel to the base. What is the shape of the slice going to be? How is its area related to A , the area of the base?

Definition: Let B be a subset of a plane, and v be not in the plane. A *solid cone* with base B and vertex v is the set of points lying on segments starting at v and ending in a point in B .

That is, to get a cone, connect v to every point in B with a segment.

Some examples of cones are below:

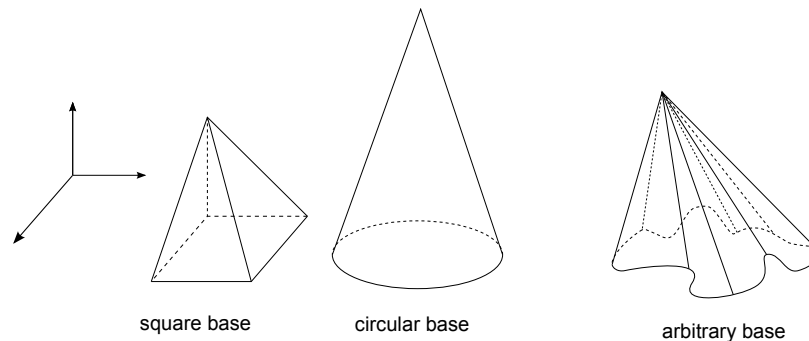


Figure 1: Examples of cones

Extra Credit: The axes of two right circular cylinders of radius a intersect at a right angle. Find the volume of the solid of intersection of the cylinders. Justify all steps.

Submit extra credit separately from homework.