

AP CALCULUS PROJECT: Volumes of Solids with Known Cross-Sections

This project will have 3 phases to it:

Phase I: Make a physical model of a solid with a known cross section on a base with a standard function. The following guidelines apply:

- 1) To avoid simplicity the base function can be any non-linear function except a parabola, square root, or absolute value, unless their use is necessary to finish a more complex idea.
- 2) In order to make your project visually appealing, you can use more than one cross section. Here is the option for possible cross sections: Semi-circles, Squares, Equilateral Triangles, or Rectangles, isosceles right triangles.
- 3) The materials can be no thicker than 0.25". Your model must be at least 3 inches long. There must be at least 15 slices. (Keep in mind, these are the minimum requirements, it is optional for you to do more)

Phase II: Each Individual will prepare at least a 2-3 page report. Your report must include:

- 1) A description of the base functions used, a sketch of the base region, and an explanation of what each slice looks like. (Optional: a 3-dimensional sketch of the region using the cross section of your choosing)
- 2) The theoretical volume of the enclosed area with your chosen cross section. (Optional: Finding the volume using a different method or cross section, etc.)

(It is preferred that the calculations be typed using mathematical software or a site that allows it. Also you can set up the integral and then just give the answer, unless you want to type all the work in between)

- 3) Description of the mathematics involved and how it calculates the volume using your chosen cross section.

In doing this, assume that your reader has no prior knowledge about the topic (tell them what a cross section is).

- 4) Is there any relevance of your model to the real world?

Phase III: Prepare a 3-4 minutes summary speech of what you did and your model to present to the class.

Optional : bring in a real world object / picture that your model resembles.

Points will be awarded as follows:

Physical Model (15 points) → (Effort, creativity, neatness, overall layout and visual appeal)

Written Report (15 points) → (Accurate presentation of the information and calculations, neatness of sketches, organization of the data)

Oral Presentation (5 points) → (Must be within the time frame allocated, informative, and to the point)

Partner Evaluation (5 points) → (As you are working on this project, are you sharing the responsibilities equally?)

Your paper and model is due Thursday May 16th. The presentations will be on Thursday as well. (Late Projects will lose 3 points for each day late, no matter what the reason.)