

Math 2414
Calculus II
Lab Exercise # 2



Name _____

Date _____

Section # _____

Semester _____

Attach the computer printouts to this sheet.

1. To calculate the area integrate each piece and add together. Answer should be around 23000 sq feet.
2. no help necessary.
3. to calculate the volume compute the following $\left(\frac{150}{360}\right)2\pi \int_a^b (x + 220)f(x)dx$ for each piece. Answer should be around 10000000 cubic feet.

Constructing an Arch Dam

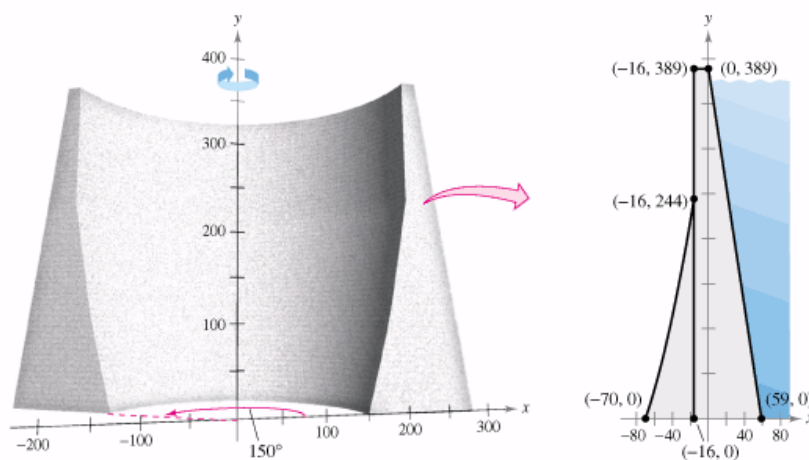
Dams were originally built to ensure water supplies during dry seasons. As technical knowledge has increased, they have begun serving other functions. Today, dams may be built to create recreational lakes, to power generators, and to prevent flooding. Every new dam creates concerns. A dam may upset an area's ecology and force the relocation of people and wildlife. Also, a poorly constructed dam endangers the entire surrounding region, creating the possibility of a massive disaster.

There are several designs used in dam construction, one of which is the arch dam. This design curves toward the water it contains, and is usually built in narrow canyons. The force of the water presses the edges of the dam against the walls of the canyon, so that the natural rock helps support the structure. This added support means that the arch dam can be built with less construction materials than its gravity-supported counterpart.

A cross section of a typical arch dam can be modeled as shown in the figure below. The model for this cross section is as follows.

$$f(x) = \begin{cases} 0.03x^2 + 7.1x + 350, & -70 \leq x \leq -16 \\ 389, & -16 < x < 0 \\ -6.593x + 389, & 0 \leq x \leq 59 \end{cases}$$

To form the arch dam, this cross section is swung through an arc, rotating it about the y -axis. The number of degrees through which it is rotated and the length of the axis of rotation vary, depending primarily on how much the water level varies. A possible configuration shows a rotation of 150° and an axis of rotation of 150 feet.



QUESTIONS

1. Find the area of a cross section of the dam.
2. Describe a strategy for estimating the volume of concrete that would be needed to build this dam.
3. Use the strategy to estimate the volume of concrete needed to build the dam described on this page.

The concepts presented here will be explored further in this chapter. For an extension of this application, select the Calculus Lab button.

Calculus Lab

