

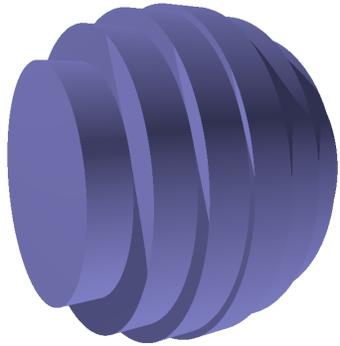
**MAT 126.01, Prof. Bishop, Thursday, Oct 1, 2020**  
**Section 2.3, Volumes by Shells**  
**Quiz 5 review**

Recall disk method from last time.

If the graph of  $f \geq 0$  on  $[a, b]$  is revolved around the  $x$ -axis, the volume of the solid obtained is

$$\pi \int_a^b f(x)^2 dx.$$

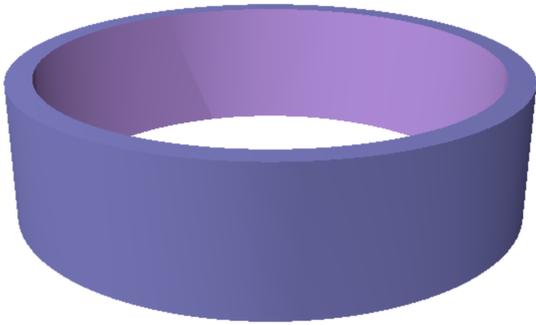
Derive volume of sphere  $V = \frac{4}{3}\pi r^3$  using disk method.



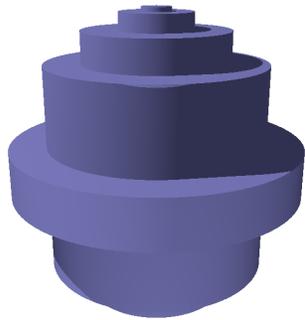
Volumes of revolution: shell method.

If the graph of  $f \geq 0$  on  $[a, b]$  is revolved around the  $y$ -axis, the volume of the solid obtained is

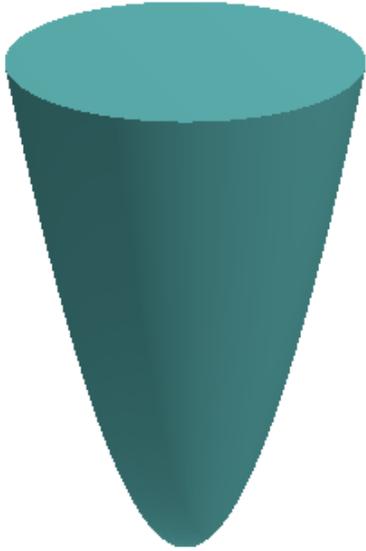
$$2\pi \int_a^b x f(x) dx.$$



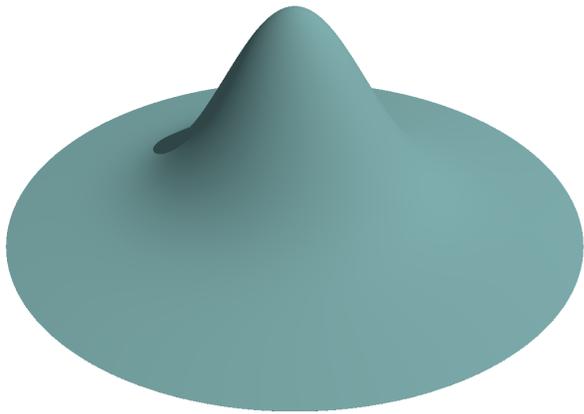
Derive volume of sphere  $V = \frac{4}{3}\pi r^3$  using shell method.



Suppose  $x^2$  on  $[0, 2]$  is revolved around  $y$ -axis. What is the resulting volume? Use shell method.



Suppose  $f(x) = e^{-x^2}$  on  $[0, \infty)$  is revolved around the  $y$ -axis. What is the volume generated?



## Quiz 5:

3 problems on recognizing  $x$ -axis rotations.

Find integral formula for disk method

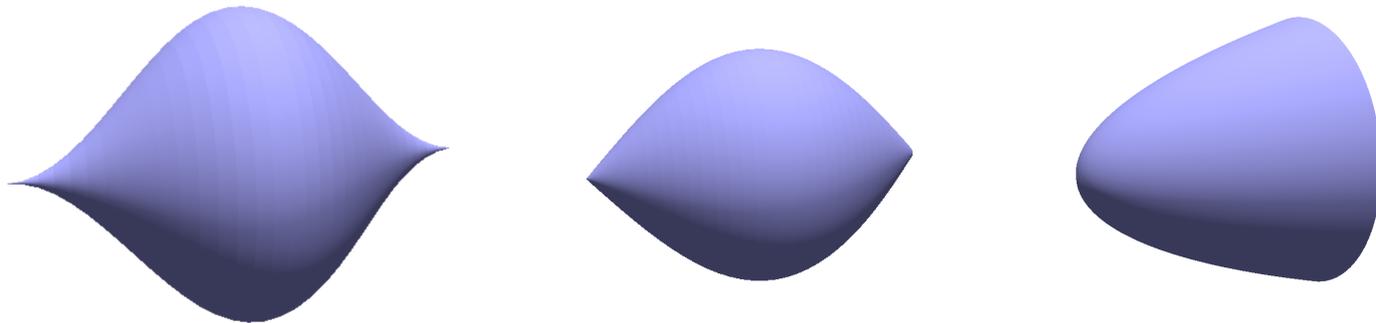
Evaluate same integral

3 problems on recognizing  $y$ -axis rotations.

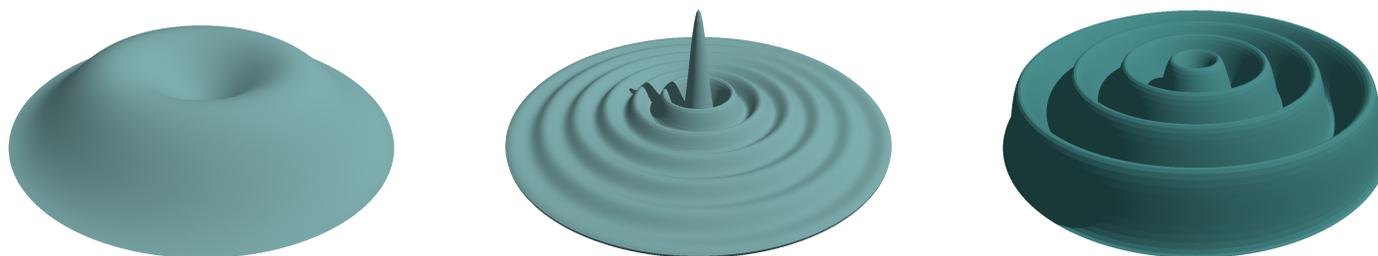
Find integral formula using shell method.

Compute a volume using shell method.

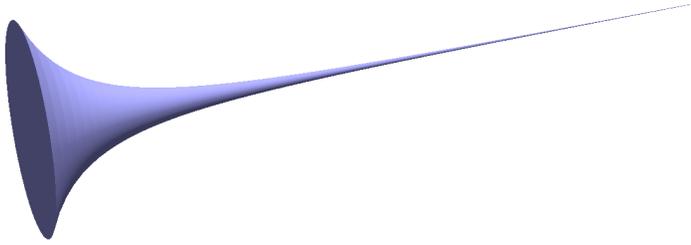
Rotate  $\sin^2(x)$  on  $[0, \pi]$  around the  $x$ -axis.



Rotate  $\sin(x)$  on  $[0, 2\pi]$  around the  $y$ -axis.

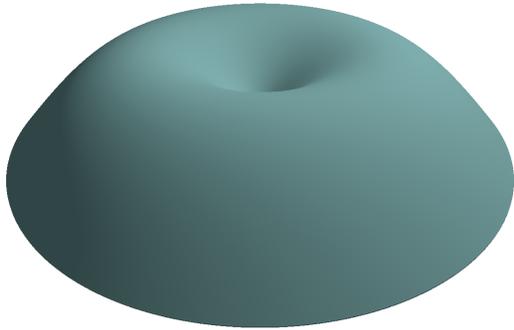


The region below is  $\{0 \leq y \leq e^{-x} : 0 \leq x < \infty\}$ , rotated around the  $x$ -axis. What is the integral formula for the volume using the disk method?



Compute the volume of the region above.

Suppose the region  $\{(x, y) : 0 < \sin(x), 0 \leq x \leq \pi\}$  is rotated around the  $y$ -axis. What integral gives the volume using the shell method?



Suppose the region  $\{(x, y) : 0 \leq \sqrt{x}, 0 \leq x \leq 1\}$  is rotated around the  $y$ -axis. Compute the volume of this regions (give a numerical answer).

