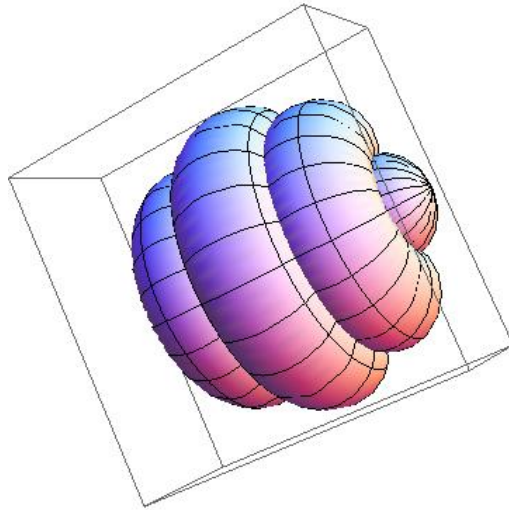


MATHEMATICA LAB IV



SOLIDS OF REVOLUTION

(Lab report due: 25th April 2018)

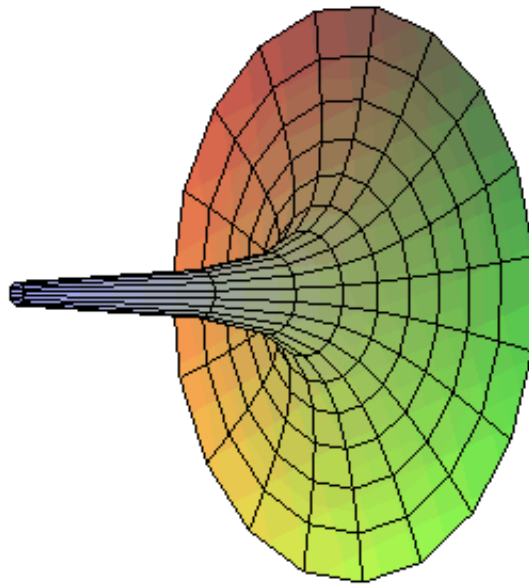
1. Plot the sphere of radius 7 cm. centered at the origin and compute its volume using the method of discs.
2. Plot a right-circular cone with base radius 5 inches and height 13 inches and compute its volume, using the method of discs.
3. Rotate one arch of the curve $y = \sin^4 x$ about the x-axis and find its volume using shells or discs. Plot.
4. Suppose that the curve $y = 1/x^4$ is rotated about the x-axis from 1 to m . What happens to the volume of such a solid as m grows without bound? Explain! Plot! (*Note:* In Mathematica, the *RevolutionPlot3D* command requires you to choose specific values for m .)
5. Consider the region \mathbb{R} bounded above by one arch of the [cycloid](#):
 $x(t) = 3(t - \sin t)$, $y(t) = 3(1 - \cos t)$, $0 \leq t \leq 2\pi$, and below by the x-axis. Find the volume of the solid of revolution obtained by rotating \mathbb{R} about the y-axis. (Express your answer to the nearest tenth.) Plot!

6. A lab glass container can be modeled by revolving the graph of

$$f(x) = \begin{cases} \sqrt{0.1x^3 - 2.2x^2 + 10.9x + 22.2} & \text{if } 0 \leq x \leq 11.5 \\ 2.95 & \text{if } 11.5 < x \leq 15 \end{cases}$$

about the x-axis, where x and y are measured in centimeters. Plot the solid and compute its volume (to the nearest tenth). (*Note:* You will need to use the *Piecewise* command to define $f(x)$.)

Torricelli's Trumpet or Gabriel's Horn



[Evangelista Torricelli](#) (1608 - 1647), a student of Galileo, made a discovery that amazed him. Let's examine what occurred.

Rotate the curve $y = 1/x$ from $x = 1$ to infinity about the x-axis, thus obtaining an infinite solid of revolution. Let us call this solid the "horn of Gabriel", after the messenger of God in the old and new testaments.



Exercises:

7. Using disks or shells, compute the volume of this solid. Is this volume finite or infinite?
8. Calculate the surface area of the horn of Gabriel. Is this surface area finite or infinite?
9. Why was Torricelli amazed? Describe the paradox.

Geeky names to give your pets

<p>Cat-enary</p> <p>μ</p>  <p>011000110110000101110100</p>	<p>Schrödinger</p> <p>Kitty</p>	<p>Dogbert</p> 	<p>Fibonacci</p> 
<p>any greek letter (alpha, beta, gamma, delta, epsilon, ...)</p>			
Cycloid	Lemma	Cuboid	
Digit (for pets with extra toes)			
Limacon	Acutie	Dwight	

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