

Archimedes' Sphere - Cone - Cylinder

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Find the hemisphere, cone and open cylinder made from Polydron Sphera pieces, and the board, trowel and heap of wet sand.

1. Use the hemisphere to compress the sand.

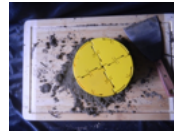
2. Drop the cylinder over the top.

3. Fill the cone.



4. Tip the cone sand into the cylinder and pack down.

The sand should fill the cylinder.



Sphere

Cone

Cylinder

Circle

Line family

Loxodrome

Equiangular spiral

Archimedean spiral

Tiling

Polygon

Plane

Line pair

Sine curve

Tractrix

Exponential curve

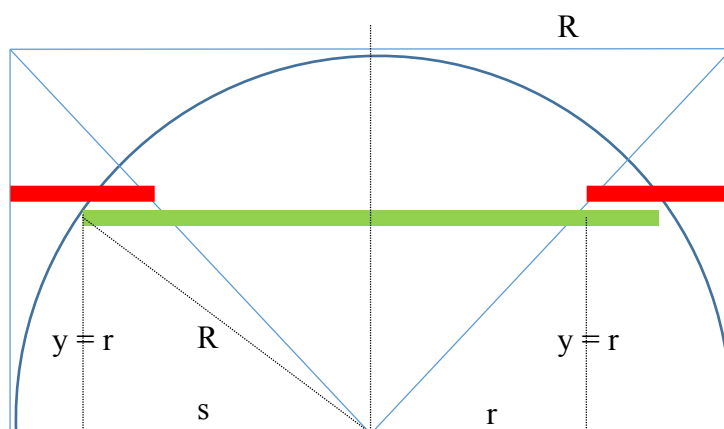
Catenary

Catenoid

Helix

Helicoid

In section we have a hemisphere sitting in a cylinder, punctured by an inverted cone:



The area of the green circle is $\pi s^2 = \pi(R^2 - r^2)$.

The area of the red annulus is $\pi(R^2 - r^2) =$ the area of the green circle.

Invoking Cavalieri's Principle (or using modern calculus), we argue that the volume of the hemisphere is the difference in volume between that of the cylinder and that of the cone.