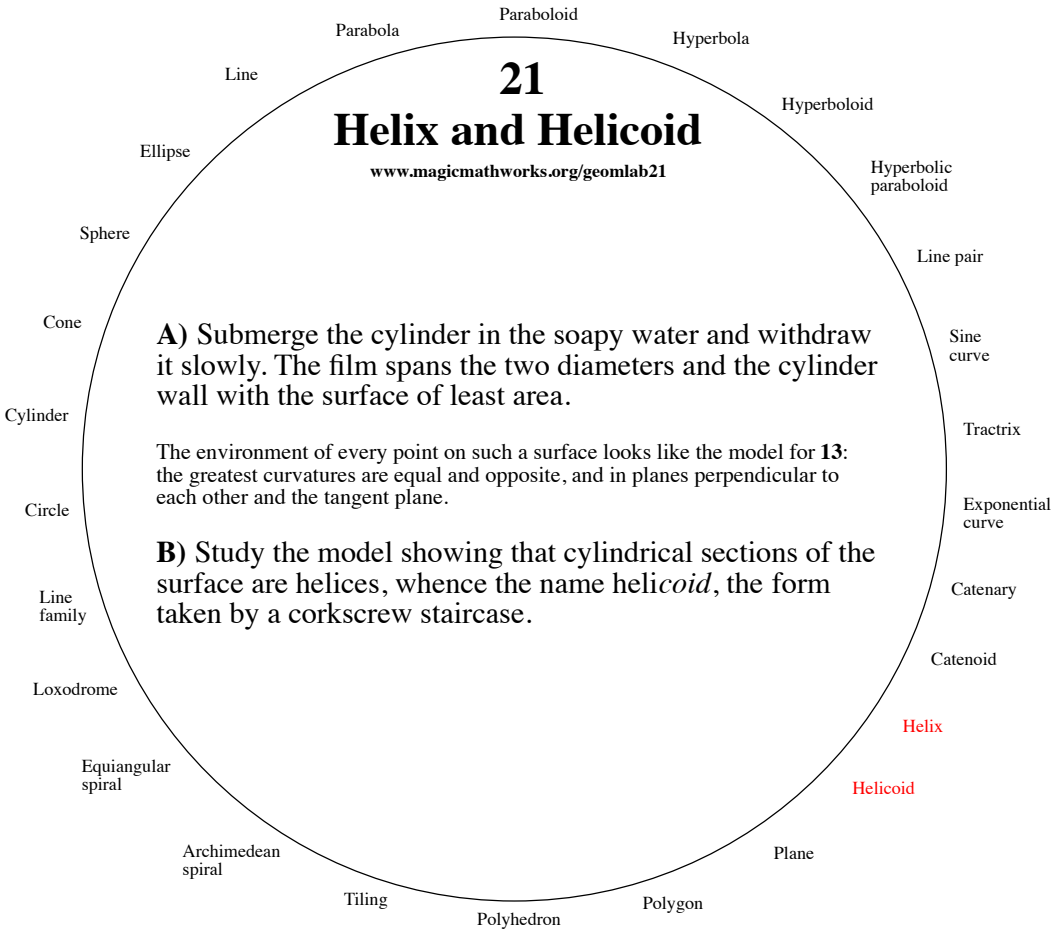
21
Helix and Helicoid

www.magicmathworks.org/geomlab21

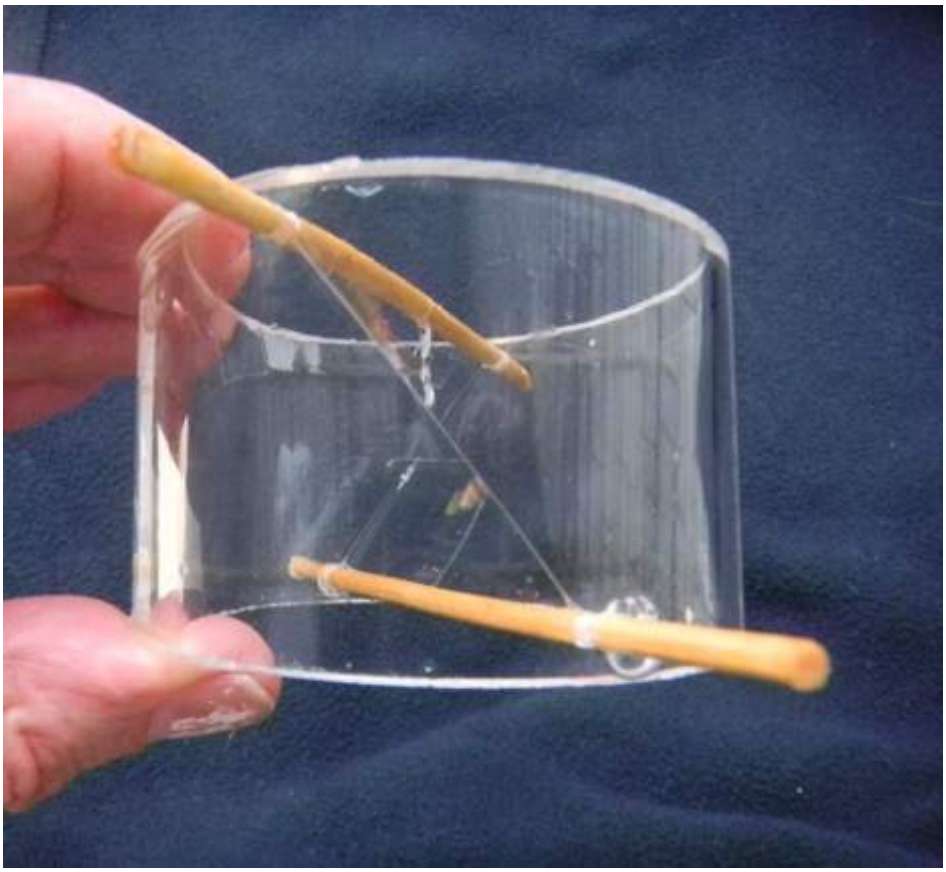


A) Submerge the cylinder in the soapy water and withdraw it slowly. The film spans the two diameters and the cylinder wall with the surface of least area.

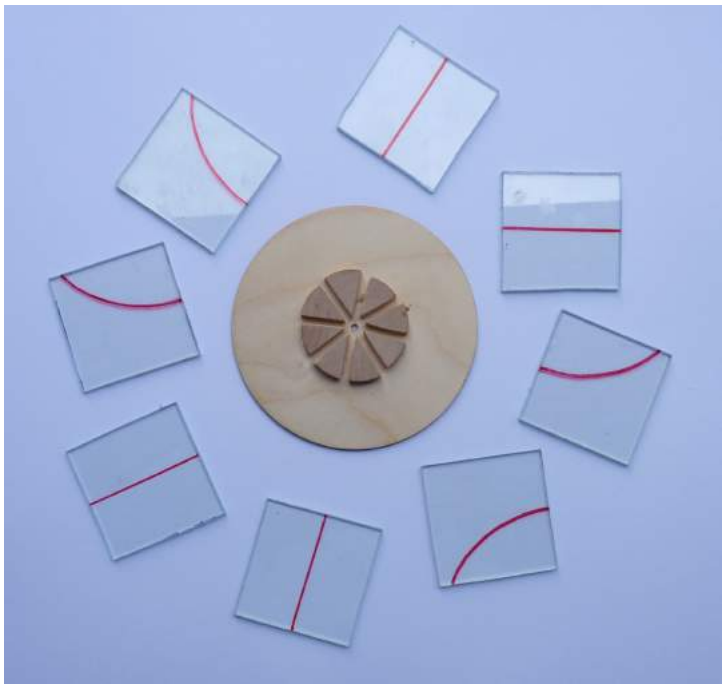
The environment of every point on such a surface looks like the model for **13**: the greatest curvatures are equal and opposite, and in planes perpendicular to each other and the tangent plane.

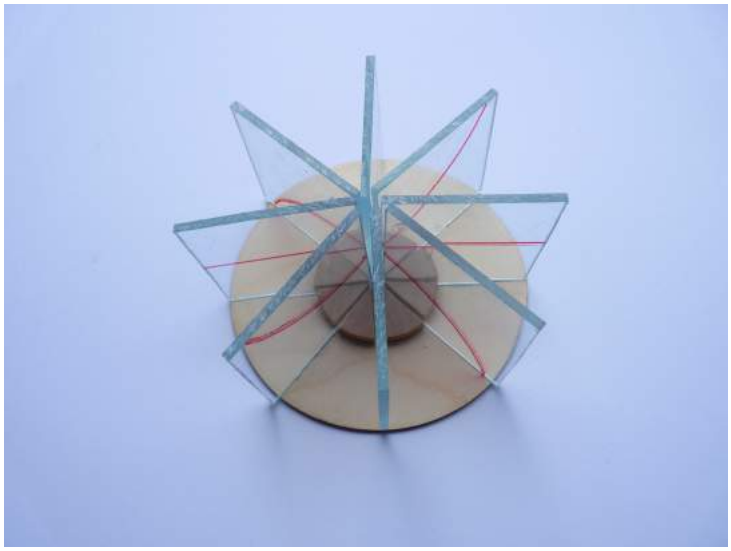
B) Study the model showing that cylindrical sections of the surface are helices, whence the name heli*coid*, the form taken by a corkscrew staircase.

A

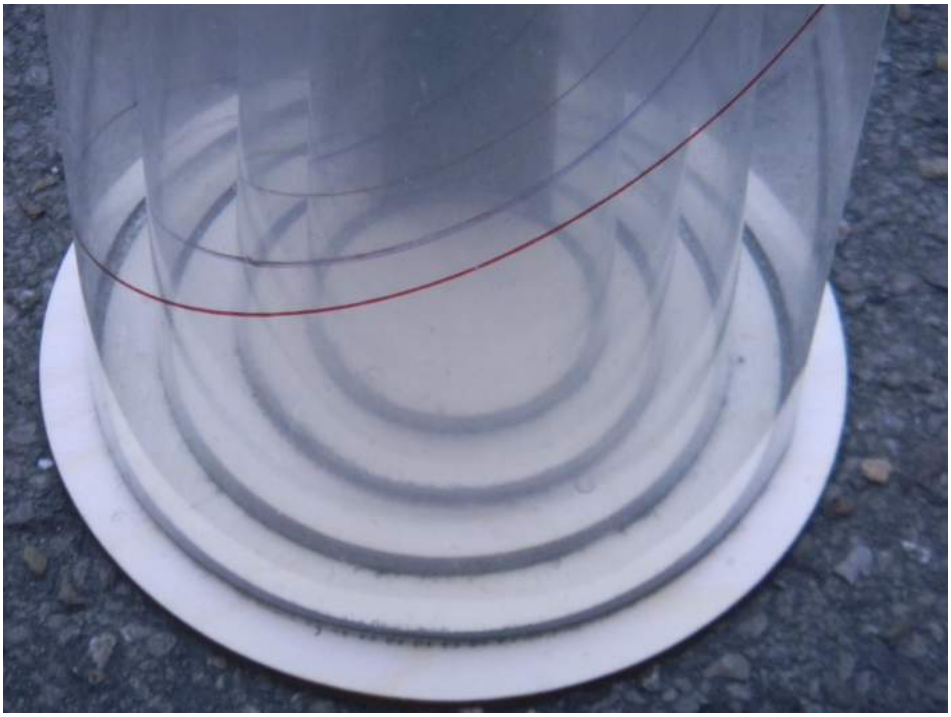


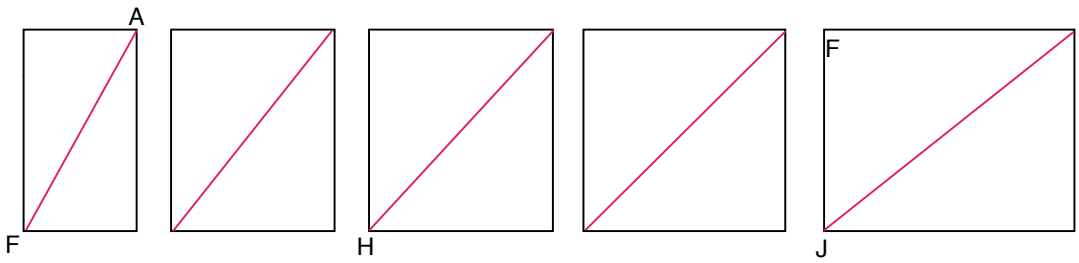
B

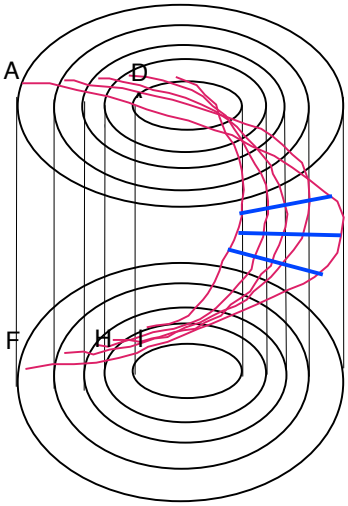




C







The above diagrams show how the model was made. Note how the gradient, measured tangentially, decreases as you move outwards from the axis. The diagram below shows the environment of a point in the centre of a step. Polar coordinates are used. The line $\theta = 0$ lies along the step. The plane is horizontal and the z ordinate plotted vertically. As is required for a minimal surface, the principal curvatures are equal and opposite and lie in perpendicular planes, namely the vertical planes for which $\theta = \pi/4$, $3\pi/4$ respectively.