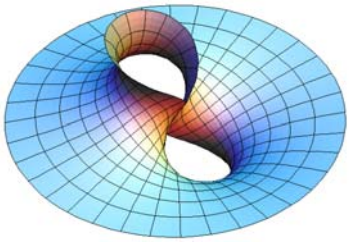
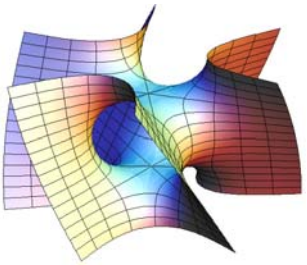
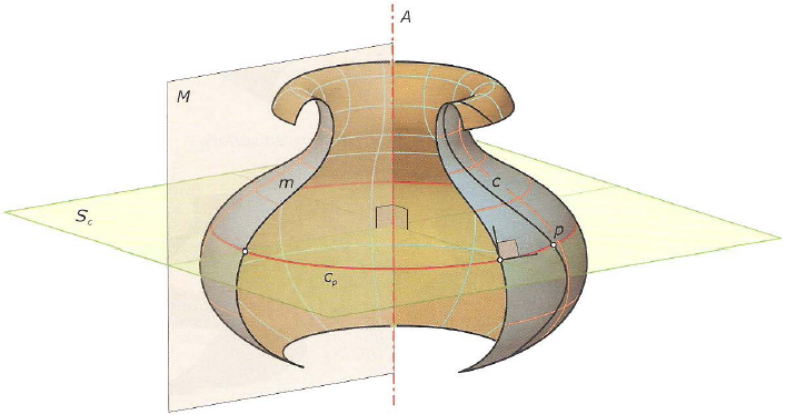
Superficies





Superficies de revolución

En el espacio, se hace girar una curva alrededor de un eje y esto genera una superficie cuyo perfil coincide con la curva original.

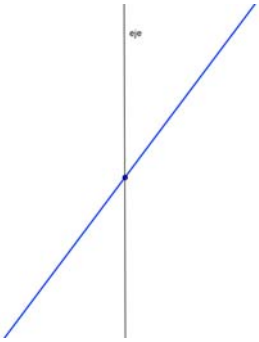


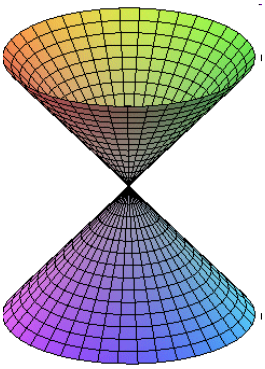
Catedral de la Asunción, Moscú, Aristotele Fioravanti, 1475-1479

Royal Pavilion, Brighton

Superficies de revolución

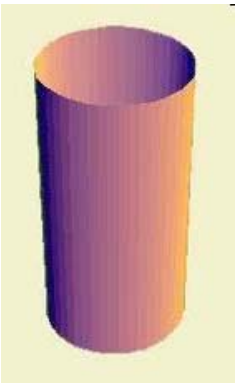
Giro de una recta oblicua al eje





Cono circular

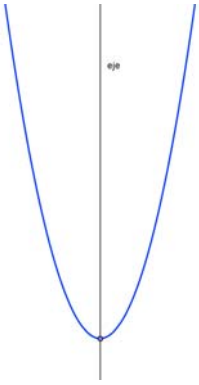
Giro de una recta paralela al eje

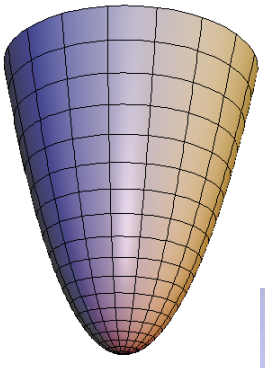


Cilindro circular

Superficies de revolución

Giro de una parábola alrededor de su eje

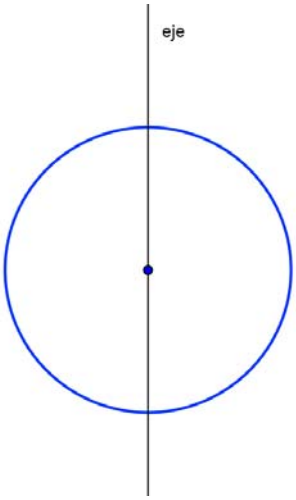


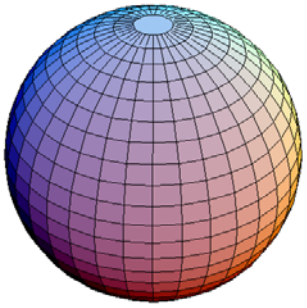


Paraboloide

Superficies de revolución

Giro de una circunferencia alrededor de un eje que pasa por su centro

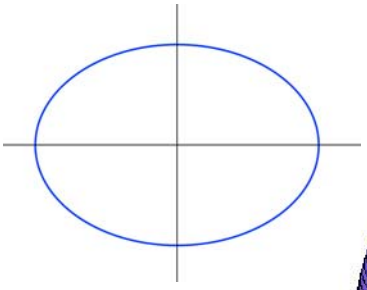


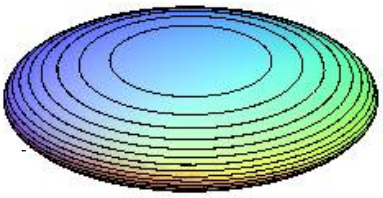


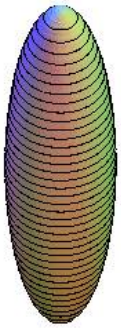
Esfera

Superficies de revolución

Giro de una elipse alrededor de uno de sus ejes







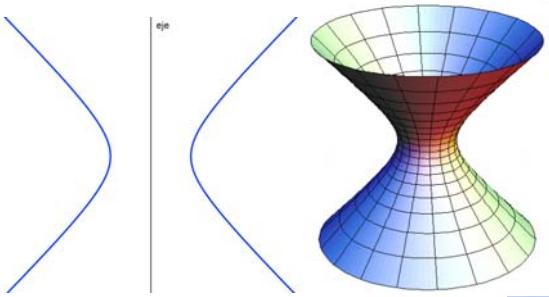
Elipsoide

Reichstag, Berlin, Norman Foster

Cornell Medical College, Qatar

Superficies de revolución

Giro de una hipérbola alrededor de un eje de simetría

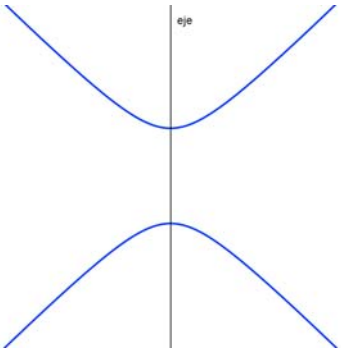


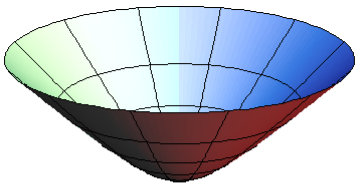
Hiperboloide de una hoja

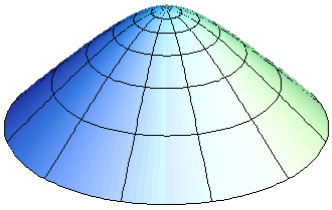
Museo Soumaya, Méjico

Superficies de revolución

Giro de una hipérbola alrededor del eje que pasa por los focos



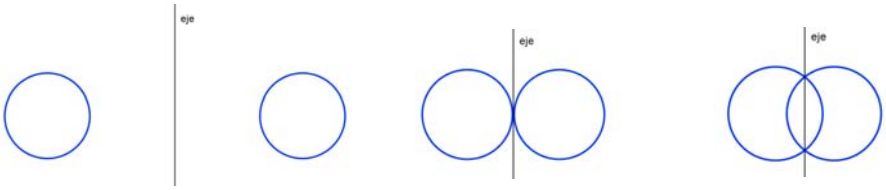


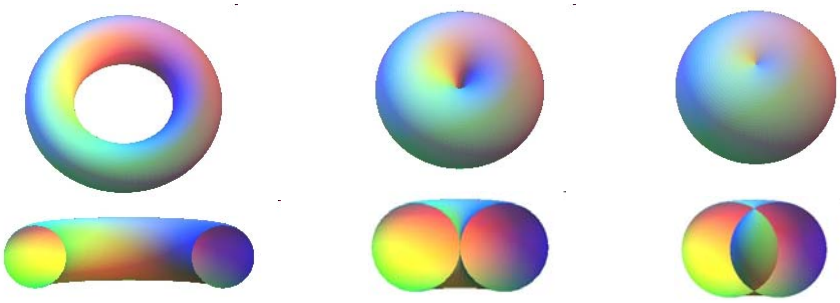


Hiperboloide de dos hojas

Superficies de revolución

Giro de dos circunferencias



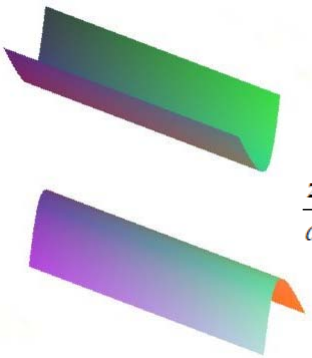


Toro

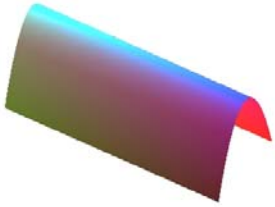
Otras cuádricas

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$$

Cilindro elíptico



$$\frac{z^2}{a^2}-\frac{x^2}{b^2}=1$$

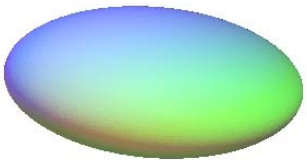


$$\frac{z}{c}+\frac{x^2}{a^2}=0$$

Cilindro parabólico

Cilindro hiperbólico

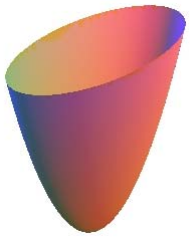
Otras cuádricas



Elipsoide
las secciones son elipses

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$$

La esfera corresponde al caso $a = b = c$.
El elipsoide de revolución corresponde a los casos $a = b$, $a = c$ o $b = c$.



$$\frac{z}{c}=\frac{x^2}{a^2}+\frac{y^2}{b^2}$$

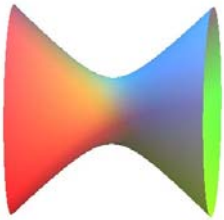
El paraboloide de revolución corresponde al caso $a = b$.

Paraboloide elíptico

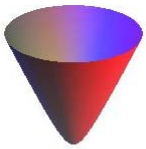
Otras cuádricas

$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$$

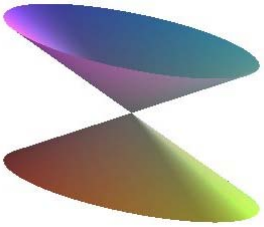
Hiperboloide de una hoja



$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=-1$$



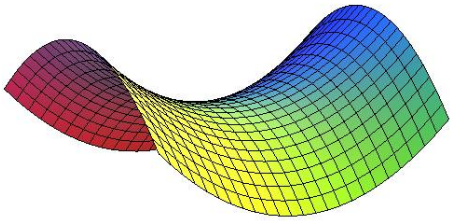
$$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=0$$



Cono elípticc

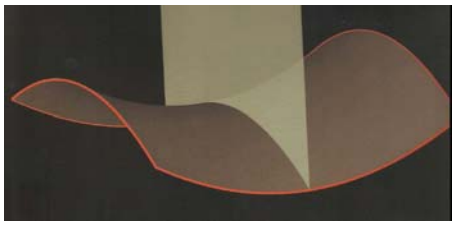
Hiperboloide de dos hojas

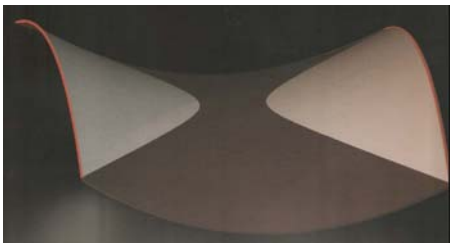
Otras cuádricas



Paraboloide hiperbólico
Silla de montar

$$\frac{z}{c}=\frac{x^2}{a^2}-\frac{y^2}{b^2}$$



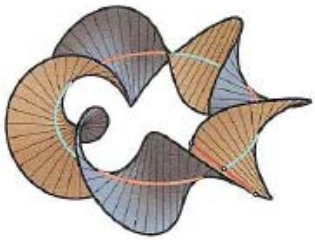


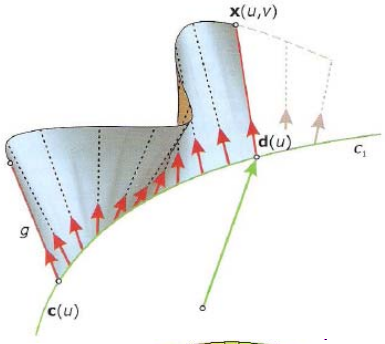
Paraboloide hiperbólico

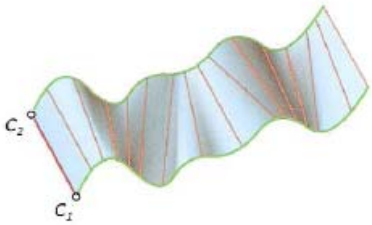
Iglesia de Becerril de la Sierra, Francisco Coello de Portugal

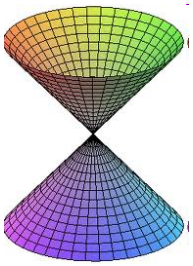
Superficies regladas

Formadas por una familia de rectas, con direcciones variadas, apoyadas sobre una curva.

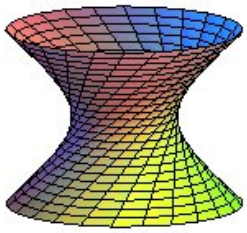


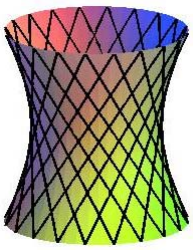




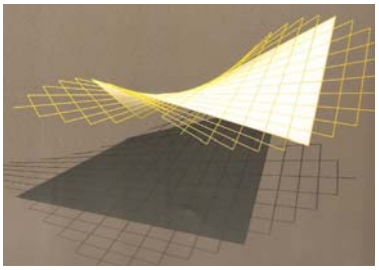


Superficies regladas

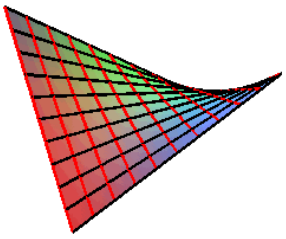




El hiperboloide de una hoja es una superficie reglada

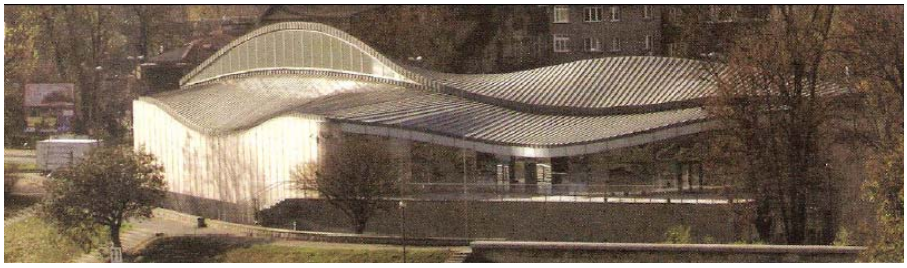


El paraboloide hiperbólico es una superficie reglada



Superficies regladas

Centro Japonés de Arte y Tecnología, Cracovia, Arata Isozaki.



Superficies regladas

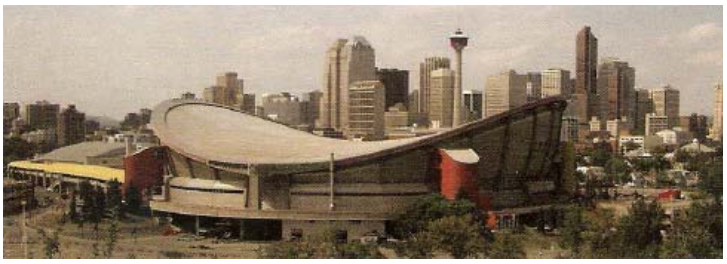
Bodegas Ysios, La Rioja

The New State Gallery, Stuttgart, James Stirling

Superficies regladas

Skiterminal Planai, Austria, Hofrichter - Ritter

Superficies regladas

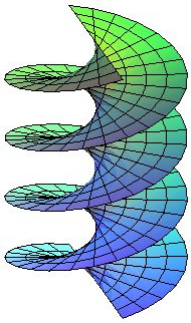


Pengrowth Saddledome, Calgary, Graham McCourt

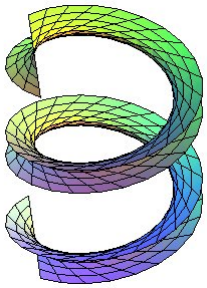
Probablemente la cubierta de cemento con forma de paraboloide hiperbólico más grande del mundo.

Se obtiene cortando un paraboloide hiperbólico con una esfera

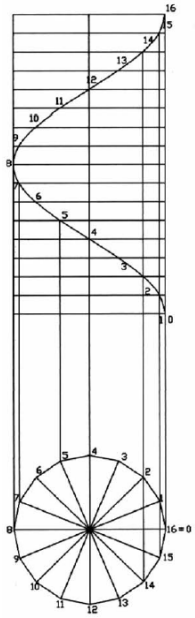
Superficies helicoidales



Helicoide reglado



Helicoide abierto



Superficies helicoidales

Palacio de Congresos y Exposiciones de Granada, Daniel Fullahondo

Superficies helicoidales

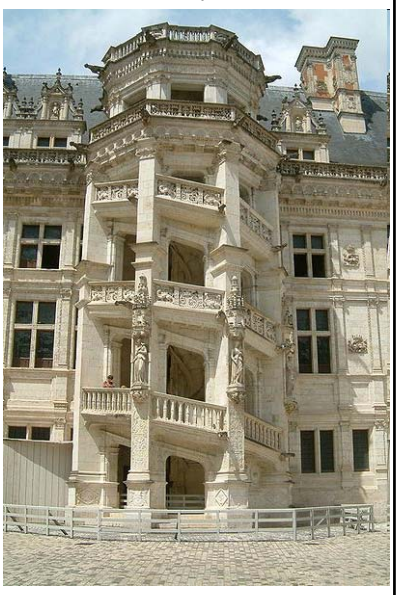
Castillo de Chambord

1519-1539, Domenico da Cortona

Escalera de caracol, doble helicoide.
Leonardo da Vinci
Enterrado en la Capilla de Saint-Hubert, a las afueras del castillo.

Superficies helicoidales

Castillo de Blois, S. XIII a XVII



Ala Francisco I

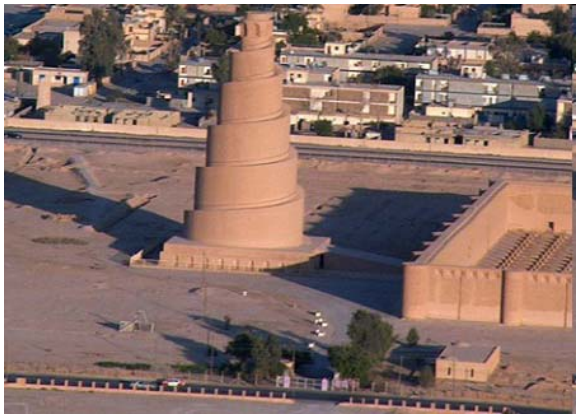
Superficies helicoidales

Escalera de triple helicoide, Domingo de Andrade, S. XVII y XVIII

San Domingos de Bonaval, Santiago de Compostela

Tulip stairs, Queen House, Inglaterra

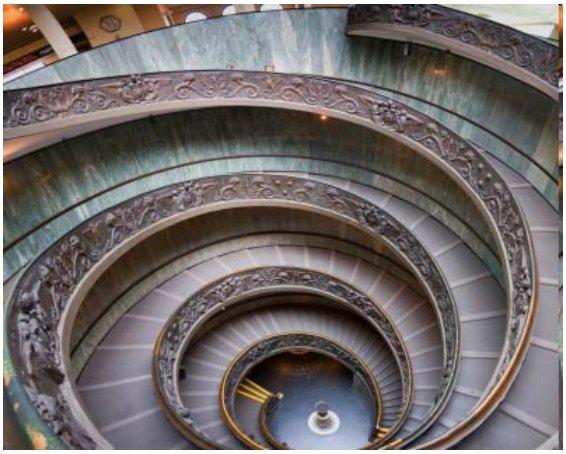
Bòvila Almirall, Tarrassa, Barcelona.
234 escalones y 63 metros de altura.



Mezquita de Al-Mutawakkil

Palacio del barón Eduard Empain de Bélgica, Egipto

Contarini del Bovolo, Venecia



Museo del Vaticano

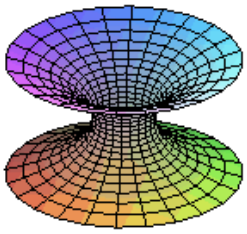
Helix bridge, Singapur

Superficies helicoidales

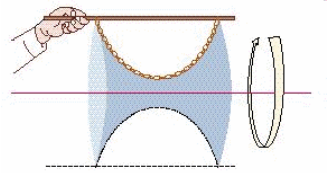
Helicoide de Caracas, Jorge Romero

Superficies torsionadas

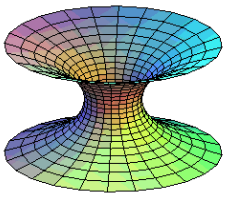
Catenoide

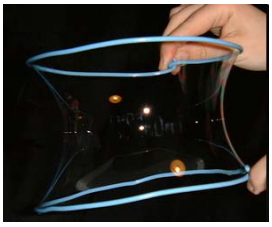


Superficie de revolución obtenida al girar una catenoide

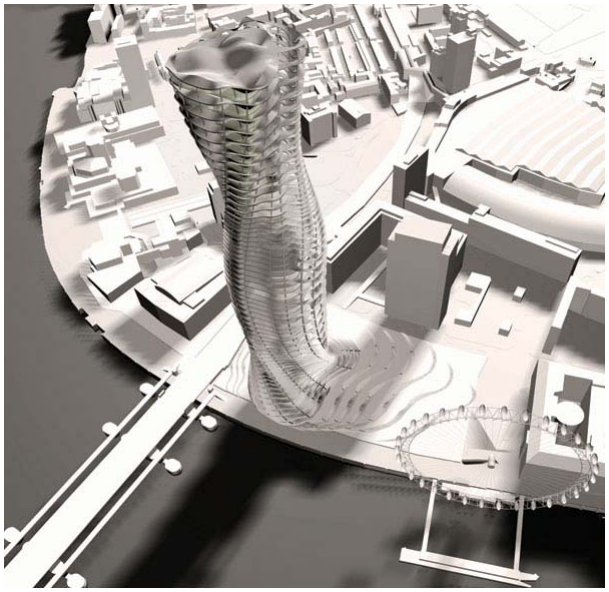


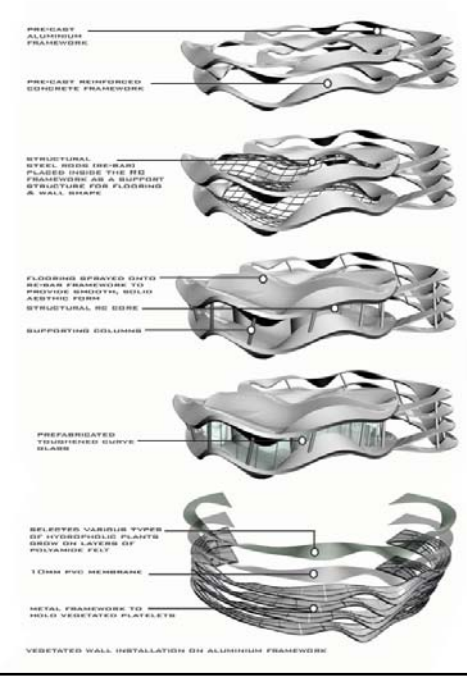
Una catenoide se puede deformar de forma continua hasta transformarse en un helicoide





Double Helix Vertical Wetland Tower in London



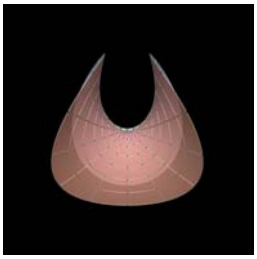


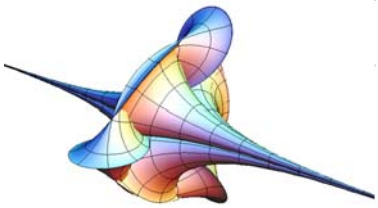
Marylin Towers
Canada

Abu Dhabi Convention Centre

Superficies minimales

http://www.indiana.edu/~minimal/archive/Classical/index.html



Otras superficies llamativas

http://virtualmathmuseum.org/Surface/gallery_o.html