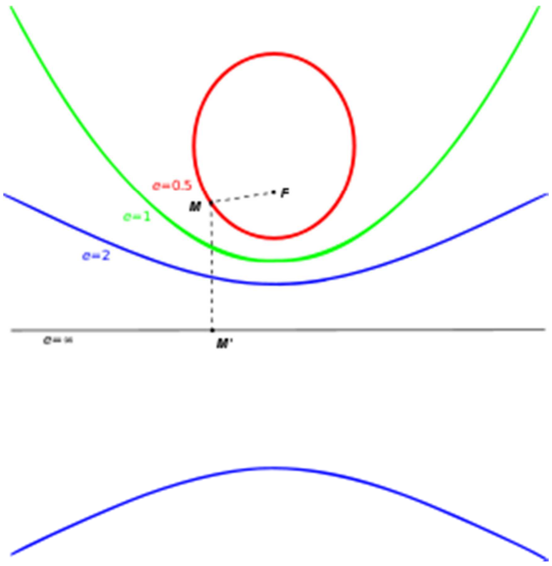
Quadrics (from wikipedia)

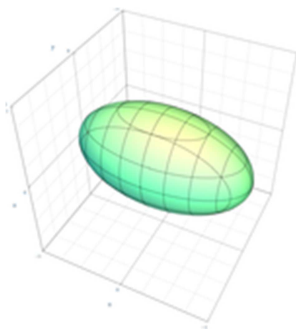
Quadrics in the Euclidean plane are those of dimension $D = 1$, which is to say that they are curves. Such quadrics are the same as conic sections, and are typically known as conics rather than quadrics.

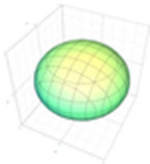
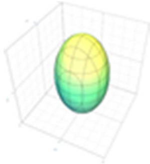
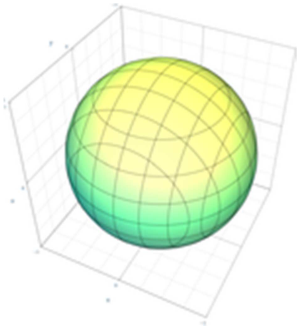
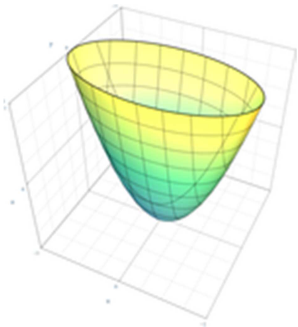
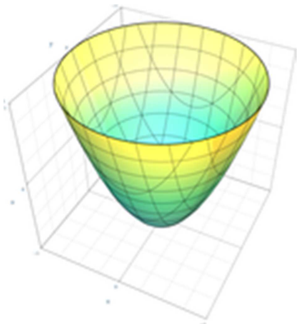


Ellipse (e=1/2), parabola (e=1) and hyperbola (e=2) with fixed focus F and directrix.

In Euclidean space, quadrics have dimension $D = 2$, and are known as **quadric surfaces**. By making a suitable Euclidean change of variables, any quadric in Euclidean space can be put into a certain normal form by choosing as the coordinate directions the principal axes of the quadric. In three-dimensional Euclidean space there are 16 such normal forms.[2] Of these 16 forms, five are nondegenerate, and the remaining are degenerate forms. Degenerate forms include planes, lines, points or even no points at all.[3]

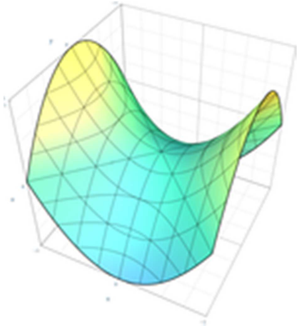
Non-degenerate real quadric surfaces

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

[Spheroid](#) (special case of ellipsoid)	$\frac{x^2}{a^2} + \frac{y^2}{a^2} + \frac{z^2}{b^2} = 1$	 
[Sphere](#) (special case of spheroid)	$\frac{x^2}{a^2} + \frac{y^2}{a^2} + \frac{z^2}{a^2} = 1$	
Elliptic [paraboloid](#)	$\frac{x^2}{a^2} + \frac{y^2}{b^2} - z = 0$	
Circular [paraboloid](#)(special case of elliptic paraboloid)	$\frac{x^2}{a^2} + \frac{y^2}{a^2} - z = 0$	

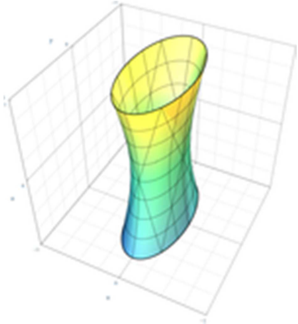
Hyperbolic paraboloid

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



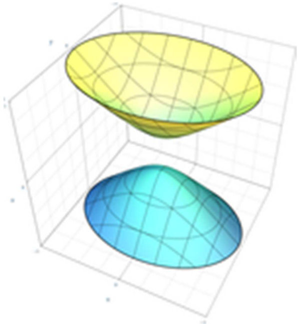
Hyperboloid of one sheet

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



Hyperboloid of two sheets

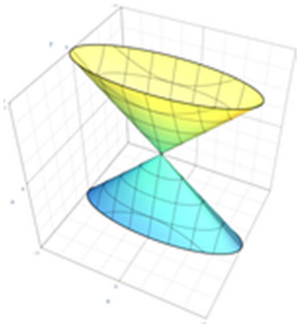
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = -1$$



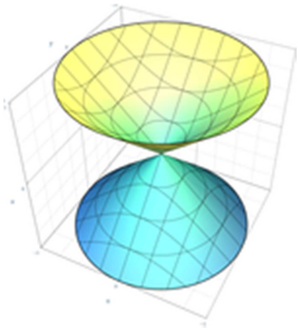
Degenerate quadric surfaces

Cone

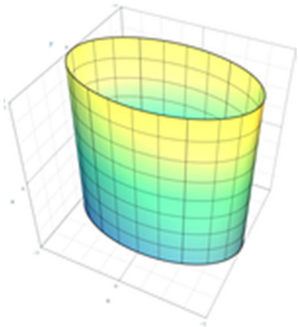
$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 0$$



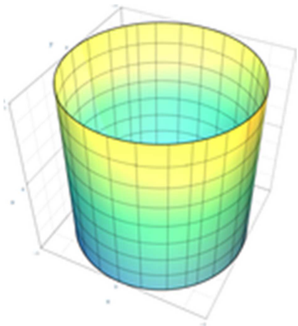
Circular Cone (special case of cone) $$\frac{x^2}{a^2} + \frac{y^2}{a^2} - \frac{z^2}{b^2} = 0$$



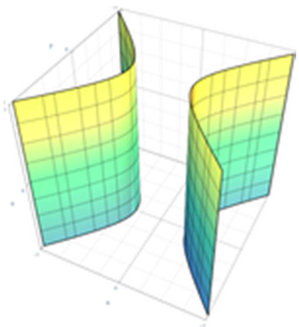
Elliptic cylinder $$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$



Circular cylinder (special case of elliptic cylinder) $$\frac{x^2}{a^2} + \frac{y^2}{a^2} = 1$$



Hyperbolic cylinder $$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$



Parabolic cylinder	$x^2 + 2ay = 0$