Lecture 6

Wednesday, May 8, 2024 10:26 PM

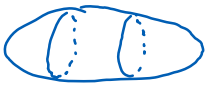
Surfaces — cylinders
Surfaces — quadratic surfaces

Cylinders are described by an equation in which one of the coords (x, or y, or z) is missing.

Quadratic surfaces: $Ax^2+By^2+Cz^2+Dxy+Eyz+Fzx+Gx+Hy+Iz=J$

Ex: $x^2+2y^2+3z^2=5$

x-cross section · ellipse
y-cross section · ellipse
z-cross section · ellipse
} ellipsoid



Ex $x^2+2y^2+z=4$

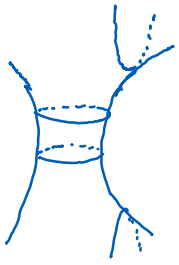
x-cross section · parabola
y-cross section · parabola
z-cross section · ellipse
} elliptic paraboloid

Ex $x^2-2y^2+z=4$

x-cross section · parabola
y-cross section · parabola
z-cross section · hyperbola
} hyperbolic paraboloid

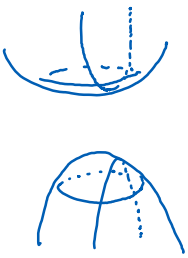
Ex $x^2+y^2-z^2=2$

x-cross section · hyperbola
y-cross section · hyperbola
z-cross section · ellipse
} elliptic hyperboloid (one sheet)



Ex $x^2+2y^2-z^2=-1$

x-cross section · hyperbola
y-cross section · hyperbola
z-cross section · ellipse
} elliptic hyperboloid (two sheets)



Ex $x^2+y^2-z^2=0$

$z=\pm\sqrt{x^2+y^2}$ (two-sided cone)

Vector functions (as oppose to scalar functions)

$r(t)=(x(t),y(t))$

$r(t)=(x(t),y(t),z(t))$

Use ParametricPlot or ParametricPlot3D commands.

* Limit of a vector function:

$$\lim_{t\to a} r(t) = \left(\lim_{t\to a} x(t), \lim_{t\to a} y(t), \lim_{t\to a} z(t)\right)$$