

Problem types for quiz 6:

Quadric surfaces and surfaces in general:

Given an equation identify and sketch cross-sections and surface

Cylinders

Identify and plot quadric surfaces

ellipsoids (footballs, pills)

elliptic paraboloids (bowls)

hyperbolic paraboloids (saddles)

hyperboloids of 1 and 2 sheets

Ex:  $x^2 - y^2 + z^2 = 1$ ,  $x^2 - y^2/4 - z^2 = 1$ ,  $y = z^2 - x^2$ ,

Compare:  $\frac{x^2}{9} + y^2 + z^2 = 1$ ,  $9x^2 + y^2 + z^2 = 1$

Identify central axis and orientation, cross-sections perpendicular to central axis, cross-sections in coordinate planes

Provide equations of quadric surfaces that meet specifications (e.g. a given type of surface, orientation, information about desired cross sections)

Curves in space

Basic curves - circles, spirals, expanding/contracting spirals, closed curves

Tangent vectors to curves, unit tangent vector, tangent lines to curves at a given point

Arc length of a curve,  $ds = \|\vec{v}\| dt$ ,  $s = \int_{t=a}^b \|\vec{v}\| dt$  setting up an integral for arc length

Derivatives of vector functions

curvature, derivatives with respect to arc length,  $\frac{d}{ds} \vec{F}(t) = \frac{1}{\|\vec{v}\|} \frac{d}{dt} \vec{F}(t)$

principal normal direction via derivative of unit tangent vector

calculating curvature,  $\vec{N}$ ,  $\vec{T}$  at a given value of  $t$