Math 3298 Worksheet 20: more review

(1) Find the equation for the tangent plane of the surface $x^2 + y^2 - z^2 = 1$ at the point $(1, 1, 1)$.

(2) The surface $x^2 + y^2 - z^2 = 1$ is a hyperboloid of one sheet.

These surfaces have the surprising property of possessing two families of straight lines contained within the surface, which can be useful, as for example in the gear design shown below.

Determine a choice of a and b as functions of the angle θ for which the family of lines

$$(\cos(\theta), \sin(\theta), 0) + u(a, b, 1)$$

is contained in the surface.

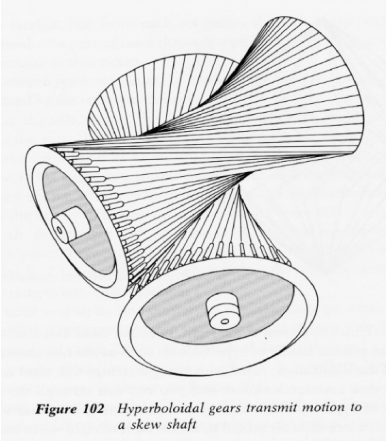

Figure 102 *Hyperboloidal gears transmit motion to a skew shaft*