

HOMework 2

1. Compute the first fundamental form for the paraboloid

$$\sigma(u, v) = (av \cos u, bv \sin u, v^2) .$$

2. Let p be a point on a smooth quadric surface Q and T_pQ the tangent plane to Q in the point p . The intersection $Q \cap T_pQ$ always contains the point p . Show that, if the intersection contains one more point p' , the whole line L through p and p' lies on Q .

Give an example of a quadric surface for which the intersection consists only of p , and an example for which the intersection is a line. Are there other possibilities?

3. For which values of $c \in \mathbb{R}$ is $f^{-1}(c)$ a regular surface, where $f: \mathbb{R}^3 \rightarrow \mathbb{R}$ is given by

$$f(x, y, z) = x^2y^2 + x^2z^2 + y^2z^2 - 4xyz ?$$

Solutions to be handed in monday februari 16, 2009.