GEOMETRY OF CURVES AND SURFACES

Homework 8 (for the week Mar 21 - Mar 23)

(1) Calculate the principal curvatures of the cone
$$X(u, v) = (v \cos u, v \sin u, v).$$

(2) Calculate the principal curvatures of the catenoid
$$X(u, v) = (u, \cosh u \cos v, \cosh u \sin v).$$

(3) Let $S = \{(x, y, z) \in \mathbb{R}^3 \mid x^2 + y^2 = 1\}$. Let $N \colon S \to \mathbb{S}^2 = \{(x, y, z) \in \mathbb{R}^3 \mid x^2 + y^2 + z^2 = 1\}$ be the Gauss map. Find the image $N(S)$.

(4) Let $S = \{x, y, z) \in \mathbb{R}^3 \mid (x - 1)^2 + y^2 + (z + 2)^2 = 1\}$ and let $N \colon S \to \mathbb{S}^2$ be the Gauss map. Find the image $N(S)$.

(5) Let $S = \{(x, y, z) \in \mathbb{R}^3 \mid z = x^2 + y^2\}$ and let $N \colon S \to \mathbb{S}^2$ be the Gauss map. Find the image $N(S)$.

Date: March 17, 2016.