Ma 109b, HW #4. Due Wednesday, February 1.

Important Note: The midterm will replace HW #5. It will be handed out on Wednesday, February 1, and due Wednesday, February 8. It will be a timed exam, lasting 4-5 hours.

Book Problems: 4.6.2, 5.5.8, 5.8.4, 6.1.2

N1: Describe the image of the Gauss map for each of the following surfaces:

   (a) The paraboloid of revolution $z = x^2 + y^2$.

   (b) The hyperboloid of revolution $x^2 + y^2 - z^2 = 1$.

   (c) The catenoid $x^2 + y^2 = \cosh^2 z$.

N2: Let $S \subset \mathbb{R}^3$ be a smooth surface. Suppose the principle curvatures k_1 and k_2 satisfy

$$|k_1| \leq 1, |k_2| \leq 1$$

for all points $p \in S$. Suppose α is a regular curve in S, and let $\kappa(t)$ denote its curvature at $\alpha(t)$. Must we have have $\kappa(t) \leq 1$ for all t?