Math 563A1, Homework 3
Due October 18, 2006
Prof. Takashi Kimura

1. (25 points) The helicoid is a surface S in $\mathbf{R}^3$ which can be covered by one surface patch of the form $\sigma(u, v) := (u \cos v, u \sin v, v)$ where $u > 0$ and $v \in \mathbf{R}$. Let Q be the set of points in $\mathbf{R}^3$ which lies in the image of the map $f : S \to Q$ which associates to each point of σ its standard unit normal vector at that point.

   (a) What kind of surface is Q?

   (b) Show that f is a conformal map.

   (c) Calculate the second fundamental form of S.

2. (10 points) Pressley Problem 5.6

3. (10 points) Pressley Problem 6.9

4. (10 points) Pressley Problem 6.18

5. (10 points) Pressley Problem 6.19