Math 136: Midterm Project

1. The rules and guidelines

• Write a lecture to teach your classmates about the topic that is described momentarily. Your lecture is to be such that the class will understand the notions that are involved and be able to use these notions.

• The written lecture should be your own work. Collaborations with others are not allowed. However, you are free to consult any sort of reference material when preparing your lecture if you indicate all such reference material using footnotes or at the end of your written lecture.

• The topic given below is from Kühnel's book and you can quote freely from Kühnel's book if you properly attribute your quotes. Even so, your paper should be more than just a repeat or paraphrase of Kühnel's discussion. Keep in mind that you are trying to teach someone else what is in the book which is not the same as repeating what the book says.

• If you formulate a statement of a lemma or theorem, you should be careful to state things precisely, correctly, and rigorously. It is OK to quote directly from Kühnel in this regard (with proper attribution).

• The paper should be around 5 pages, but clarity of exposition trumps length.

• The paper is due* in electronic form (pdf file from LaTeX or similar, or scan of a handwritten document on appropriately sized and lined paper) by **11:59pm EST** on **Monday, October 19**. Send the project to me at the address: `cgerig@math.harvard.edu`

**However, if you need an extra day or two to submit the document, I am flexible and please notify me in advance. There will still be a HW#6 posted on the 19th with its usual weekly deadline.*

2. The topic

The goal of your lecture is to explain to the class the basics of *minimal surfaces* (in $\mathbb{R}^3$), specifically about Chapter 3D up until Corollary 3.31 (not including it). In particular, your lecture should contain at least the following:

• Provide more details on some aspects of Kühnel's discussions.

• Explain that minimizers of the area functional with fixed boundary are minimal surfaces.

• Provide examples (and computations) of some minimal surfaces.

• Show by example and/or intuition why a minimal surface need not be area-minimizing.

If you have time, you may also talk about other interesting facts or uses of minimal surfaces.