Math 131A/2 Winter 2002 Handout #1
Instructor: E. Effros, MS 6931.
Lecture Meeting Time: MWF 1:00PM-1:50PM
Location: KNUDSEN 1240B
TA Asger Tornquist
Recitations Tues 3:00-3:50 MS 5117,
Thurs 3:00-3:50 GEOLOGY 4645
Office hours (tentative): TF 4-5 in my office or in MS 6943

Grading There will be one hour midterm and a three hour final examination. There will approximately seven or eight assignments.

Your grade will be calculated as follows: Hour exam 25%, Final 50%, Homework 25%.

Webpage I am hoping to use the webpage for posting various pieces of information. If this works out you should check it regularly.

Prerequisites

- Undergraduate real variable theory - roughly speaking all that you will need is analysis on the real line - this is covered in Math 131a at UCLA.
- You should already be able to write coherent proofs.

You may find that you do not have enough of a mathematical background for this course. To help you to determine whether this is the case, I plan to give a practice exam early in the quarter, *that won't count towards your grade.* In any case if you feel insecure you might want to sit in a 131a class, and then transfer if necessary.

Here are some simple logical principles (which I extracted from an undergraduate real variable course):

The most common logical **errors** made by beginners:

- They think that "or" is exclusive: thus although they know that $\leq$ means "less than or equal to" they think it is "wrong" to write $3 \leq 3$ because they know that "actually, $3 = 3$"
- They think that you cannot prove $P \Rightarrow Q$ if you already know that P is false.
- They think that if $P \Rightarrow Q$ is true, then Q is true.
- When asked to prove $P \Rightarrow Q$ they instead prove $Q \Rightarrow P$.
- They get $=$ (equality - say of sets or numbers) mixed up with $\Leftrightarrow$ (logical equivalence, used for propositions).

Some *correct* illustrations of logic:

- The proposition "$6 < 7$ or $4 < 5$" is true.
- The proposition "$1 = 2 \Rightarrow 0 \times 1 = 0 \times 2$" is true.
- The proposition "For any real number x, $x + 2 = 3 \Rightarrow x(x + 2) = x3$" is true.
- The proposition "For any real number x, $x(x + 2) = x3 \Rightarrow x + 2 = 3$" is false.

It is important to be able to take the negations of statements (in order to prove things by contradiction). Here is the general scheme.

$$
\begin{array}{rcl}
\tilde{}(P \text{ or } Q) & \Leftrightarrow & (\tilde{}P) \text{ and } (\tilde{}Q) \\
\tilde{}(P \text{ and } Q) & \Leftrightarrow & (\tilde{}P) \text{ or } (\tilde{}Q) \\
\tilde{}(P & \Rightarrow & Q) \Leftrightarrow (P \text{ and } \tilde{}Q) \\
\tilde{}((\forall x)P(x)) & \Leftrightarrow & (\exists x)(\tilde{}P(x)) \\
\tilde{}((\exists x)P(x)) & \Leftrightarrow & (\forall x)(\tilde{}P(x))
\end{array}
$$