Quiz 1 on Friday, October 20, in class.
Extra Office hours Thursday 2:30-3:30 and 4-5 in my office, PDL C338.

The quiz will have two problems. Each problem will ask you to give a 2-column proof of a theorem (or 3-column, if you want to number your steps), but for different "Imagined Readers."

The point of the first problem is to test your understanding of how the rules of algebra are justified from a small set of axioms and definitions. A list of the Axioms and Definitions from the "GROUP I: FIELD AXIOMS" section of "Axioms for Real Numbers" will be attached to the quiz. You should write a proof for the Imagined Reader we had for the first homework. Recall that this reader needs you to note every use of every axiom and every definition, and every use of substitution. You should apply the axioms and definitions one step at a time. You may use both an axiom and substitution in the same step, but need to cite both of them as reasons.

Sample problem 1. Give a 2-column proof of the following Theorem. Show every use of an axiom or definition from the attached list, and cite them by name or number in the "Reasons" column. Also say when you are using substitution.

Theorem. Assume a, b, c and d are real numbers. Then

$$(a+b)(c-d) = ac - ad + bc - bd.$$

(An answer for this sample problem will be available by Thursday noon.)

Other examples of the types of theorems you might be asked to prove: Theorems 17-19 and 34-38. These can all be proved using just the axioms and definitions. Or you might be asked to prove Theorem 12, 13, 14, or 15; for these, Theorem 11, $-a = (-1)a$, would be included on the attached list of things you can cite as reasons.

For the second problem, the Imagined Reader will be the one for the third homework, the one who is comfortable with all the axioms and theorems in the "FIELD AXIOMS" section of "Axioms for Real Numbers" and does not need a reference to them when they are used. This is the Imagined Reader the textbook uses, so the 3-column proof on p. 21 satisfies the requirements of this reader. You can either say "Algebra" as the book does, or mention one or more of the axioms you are using. (Don't include ones you aren't using.)

Remark: In this proof, the numbering "Q1" and "Q" of the last two statements is a result of working backwards from the desired conclusion to figure out the proof. If this were my draft proof, in my final version I would change the last three lines to the following.

Step	Reason
$q = 2mn + m + n$ is an integer	Closure of $\mathbb{Z}$ (Axiom 11) and define q
$xy = 2q + 1$	substitution from previous two steps
$x \cdot y$ is an odd integer	Definition of odd integer.

The axioms, definitions, and/or prior results provided for this problem will be chosen to match the question you are asked. For instance, if you are asked to give a 2-column proof of

Theorem 51, you will be given Order Axioms 8 and 9 and the definitions for “<” and “>”. If you are asked to prove a result like one of the homework problems in §1.2 (Practice or Hand-In), you will be given the definitions of odd and even integer.

More examples of the types of theorems you might be asked to prove: with Theorem 41 provided, prove Theorem 42 or 43 (do cases), or both Theorems 51 and 57 (prove Theorem 51 from the axioms and definitions, then use Theorems 41 and 51 to prove 57).

(An answer to one of the problems from §1.2, suitable for the quiz rules, will be available by Thursday noon.)