MATHEMATICS 300 — SPRING 2001

Introduction to Mathematical Reasoning — H. J. Sussmann

HANDOUT NO. 10—April 26, 2001

1 HOMEWORK ASSIGNMENT DUE ON APRIL 30

1. Problems 2(b),(c),(d) and 6(b) from section 34 of the book.

2. Problems 9, 10 and 19 from section 35 of the book.

3. Prove that the following numbers are irrational: $\sqrt{3}$, $\sqrt{4}$, $\sqrt{5}$, $\sqrt{6}$.

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2 FINAL READING LIST

1. Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 31, 32, 33, 34, 35, 39 from the book.

2. All the handouts. (This includes Handout No. 11, which you will get on Monday April 30, and also the solutions to the problems of the two midterms.)

3. Your notes about all the material covered in class.

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3 THE FINAL EXAM

The final exam will have approximately the same structure as the second midterm (but will be longer, of course).

In particular, it will contain lots of questions about definitions and proofs that were given in class or in the book or in the handouts. *Make sure you study all this material carefully and systematically. Just reading things once or twice in a hurry is not enough.*

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4 THE FINAL GRADE, AND HOW TO GET AN "A"

The final grade will be computed by

1. determining a total score based on the midterms, the homework, and the final, each one weighing 1/3 of the total,
2. determining a total score based on the final exam only,
3. using, for your final grade, whichever one of the two is higher.

In other words: **if you get an A in the final exam then you will get an A in the course even if you did not do well in the homework and the midterms.**

This means that **everybody, even those who have been doing poorly until now, has a chance to get a good grade, even an A.**

The catch is: **you have to persuade me, by doing well in the final exam, that you really learned the material of the course.**

So far, the performance of most students is not up to the standards needed to get a good grade. It is clear to me from reading your work that many students are not taking the course as seriously as they should, and are not listening to the points that have repeatedly been made in class.

For example, people are still using letter symbols incorrectly, in spite of rather detailed explanations of how letters should and should not be used.

People are still giving definitions not using the correct format for a definition. (This is particularly shocking to me, because the book has lots of definitions, and they are all in the right format.)

In the second midterm, most students could not do the problem on expressing the number 50 as a difference of two squares, even though that problem was done in detail—with 30, rather than 50, but that's very much the same—in Handout No. 4. (This tells me that the students did not read the handouts carefully and study what's in there.)

Students are still failing to justify steps in proofs. Students are still making incorrect claims, such as the assertion that "$2+(1+1)=(2+1)+1$" is the axiom on associativity of addition. **It is not!!** The axiom on associativity of addition says

$$\forall x, \forall y, \forall z, (x+(y+z)=(x+y)+z)\,,$$

which is not at all the same as "$2+(1+1)=(2+1)+1$."

Students are still systematically misusing the logical rules, for example by taking a sentence such as "$\forall x, (x=x) \longrightarrow 1=1$" and "specializing to $x=3$ by rule 6.U" to get "$3=3 \longrightarrow 1=1\,$." **You cannot do that! Rule 6.U does not say that you can!** Rule 6.U applies to universal statements, and "$\forall x, (x=x) \longrightarrow 1=1$" is an *implication*, not a universal statement.

So **please, when you do a formal proof in the final exam do not tell me that something is an axiom when it is not, and do not make up rules of your own that are not is the list and are just figments of your imagination.**

If you have been making these or other mistakes, you can change things. All you have to do is study hard and make a serious effort to learn what you are supposed to learn. I know you can do it. You are all smart and talented people. I am sure you can all learn, for example, that $P \longrightarrow Q$ is true if P is false. **It's not that hard! All you have to do is read the course material and pay attention to it.**

Good luck to all of you. It would make me very happy if I could give good grades to everybody. Please make my dream come true: what I would like to see is a final exam showing that the students really took the course seriously, worked hard, and learned.