Wednesday, October 16, 1996

To: 251 Course Coordinator, Undergraduate Vice-chair & other interested parties
From: S. Greenfield
Re: Math 251 so far

I thought I'd give you a progress report after the first exam in sections 19 and 20 of this course. Realize, please, that I am teaching the Douglass/Cook section of Math 251. My previous experience teaching this course at D/C compared to teaching it several times at Busch tells me to expect that my students will be substantially weaker in some math skills and will not perform as well as on comparable exams as Busch students. My students are mostly biochem majors, and the difficult courses they are taking do not have the same math emphasis as the courses classically taken by physicists, chemists, and engineers and therefore the D/C students generally do not receive the same "reinforcement" of math skills as those majoring in the other named subjects.

The present `maple` labs are a distraction. Many of my students have worked sincerely on these labs, and the time and effort they are putting in seem to be decreasing their success with more traditional skills. I have decided to severely prune what I'm going to ask students to do with `maple` (e.g., in `maple` lab #3, I am asking them to do only problem 1). I do believe there is a role, properly supported, for `maple` in this course. My students really would have benefitted from a few organized sessions in a properly equipped computer lab. The computer consultants generally available know very little about `maple`. The initial `maple` labs should be shorter, less ambitious, more didactic(?), and more elementary.

My students *should* especially benefit from the workshop problems. Many of them will actually use calc 3 knowledge in rather descriptive circumstances, and will need to apply the knowledge when the methods aren't applicable in a cookbook fashion. But the success of the workshops in Math 151-152 doesn't seem to be carrying through here. The students need much more time in recitation to answer routine questions. In 151 and to a lesser extent in 152 the rote skills were already exposed once to most students in high school. The result in 251 is that much less time is available for workshops in class. I will probably ask for no more than two or three more workshop solutions from students during the rest of the semester. I may change that decision but ... Do we need another class meeting each week in this course?

The fact that we didn't decrease the number of routine textbook problems on our syllabus (as was deliberately and drastically done in Math 151 and 152) and did increase the workload in other ways (with workshops and `maple` labs) means that students are neglecting this aspect of the course. Even though I don't believe that students last year were usually spending an average of 8 hours/week on Math 251, a 4 credit course, I do believe that my students, who are taking organic chem and biology, cannot put in huge chunks of additional time on this course compared to what "they" (or their avatars last year) were doing. The course isn't that important to them. This may be different on Busch where the math is immediately relevant in a host of majors and where the use of math is reinforced in many courses those students are taking.

I have no firm recommendations for the future of this course now. I just wanted to tell you what's happening with my sections.

Some statistics on the grades of the first exam (which several faculty members called too short) are the following:

Mean grade: 61.667; median grade: 61; standard deviation: 17.089.

Maximum grade achieved: 96; minimum grade achieved: 9.

A total of only 39 students took the exam. There have been and will be some make-up exams. I gave D's and F's to students with grades below 55; there were 12 of those. I gave A's, B+'s and B's to students with grades 80 or above; there were 12 of those. So 15 students got C and C+.

Appendix: more on `maple`

These sentences were added after I was told that my remarks would be distributed to additional people. I am in favor of using `maple` in the course. I asked for the D/C section in the hope that I would get one of the "smart" classrooms and could have `maple`'s help during lectures (I had to change the classroom for another reason – that's not `maple`'s fault!). How has `maple` helped?

- I asked students to hand in for grading textbook problem 16 of section 12.7: find and classify critical points of a specific rational function. After some e-mail exchanges with students who were finding the problem intricate, I suggested by e-mail to the whole class that `maple` might make the problem easier. I even outlined a `maple` solution. A number of students did use `maple` to help with this problem.
- I asked students to write up and hand in a solution to problem #2 on workshop 6. This problem asks for the best mean-square line approximating the exponential function on the interval $[0, 1]$. I remarked at the end of each recitation/workshop that I could do the computational part of this problem in less than 2 minutes with "my silicon friend" (which students knew meant `maple`). Of course I have since gotten e-mail suggesting that some students *couldn't* figure out what we *want* in the problem even *with* `maple`, but: I commonly use `maple` to do such computations now, and I think they should, also*.
- My lectures have been somewhat influenced by `maple`. For example, I talked about the second derivative test for extrema slightly after `maple` lab # 2 was handed in. Part of that lab asked for people to slice quadratic surfaces near (but not at) the critical point. I therefore tried to use the intuition developed by those slicing exercises in my explanation of the Hessian, etc.: use Taylor's theorem to approximate by a quadratic polynomial in two variables, try to see when the approximate level set is an ellipse or a hyperbola by using the number of solutions of the level set in y given x to obtain the result based on the discriminant, etc. I *hope* this went over well, but believe that almost all students will only vaguely learn the mechanics of the second derivative test and that many students may resent a class lecture presenting an approach significantly different from the text's version. (Sigh.) I also gave as a workshop problem a result of Euler's where he applied the second derivative test *in*correctly.

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* ... if they understand what they are doing ...