Teaching Statement: Frank Thorne

My long-term goal is to be a university professor, and to be a good one. Naturally this involves a commitment to excellent teaching, and this is a commitment I look forward to. I have had the good fortune to learn from many dedicated, outstanding teachers, so I have a keen understanding of the difference this can make. I aspire to follow in their footsteps, and I take it for granted that this will require considerable effort. I feel that I have done a good job of teaching at the University of Wisconsin and elsewhere, and I look forward to continuing to improve throughout my career.

I believe that good teaching at any level starts with a positive attitude, and in particular with enthusiasm and respect. For me, enthusiasm about mathematics is natural, and I am constantly working to communicate whatever is interesting or important about a particular topic. I find that mathematics is full of surprises and miracles, and I do my best to present it this way. For example, in teaching a course in college algebra, I needed to teach the standard formulas for the sum and product of the roots of a quadratic. I chose to simply dive in: I wrote the formula $x^2 - 13x + 41 = 0$ on the blackboard and found the sum and the product of the roots by brute force, which involved multiple boards of messy fractions and square roots. When they all canceled at the end, one of my students asked in astonishment, "Does it always work out like that?" Later, she told me that was the first time she'd left a math class happy.

As for respect, it is not for me a conscious decision. It is a matter of logic and common sense. As a graduate student I am occasionally too overwhelmed or distracted to effectively learn, and it is natural that I should expect the same of my students. I also know from repeated experience that hard work pays off in the long run, and that extreme initial difficulty with a subject does not preclude eventual mastery. This knowledge strongly informs my attitude towards teaching. My students have written on my evaluations that "Frank never makes you feel stupid for asking questions." Indeed, I can't possibly imagine ever doing so.

Although a positive attitude is of primary importance in teaching, I have also found a number of particulars to be vital. I think carefully about precisely what I should say and write in the classroom, and I do this before and after classes so that this becomes instinctive while teaching. For example, my reaction to any mistakes I make is very deliberate. Although it is tempting to reach hastily for the eraser, I believe that this misses an excellent educational opportunity. Instead, I call attention to my mistakes, discuss how they were made and recognized, and fix them carefully in such a way that the students understand (and, if they are taking notes, can transcribe) what I am doing.

So far, most of my teaching at Wisconsin has been for lower level courses, where the syllabi and exams have been written by others. In this setting, I have found it prudent to stick closely to the syllabus and conform to student expectations. At the same time, I have developed ways of being creative even within this fairly rigid framework. For example, when teaching geometric series to college algebra students, I wrote the following formula on the

blackboard:

$$\text{Sum} = \frac{\binom{\text{first}}{\text{term}} - \binom{\text{first term}}{\text{not in series}}}{1 - r}.$$

This formula is easy to remember, accurate, and compatible with the usual, more formal equation. I emphasized to my students that whether they used this formula or the formula in the book was a matter of taste and individual preference; when I graded my students' exams I was gratified to notice that not everyone did the problem in the same way.

I enjoyed a very different teaching opportunity this summer, as an instructor for my advisor Ken Ono's Research Experiences for Undergraduates (REU) program. My primary responsibility was to mentor a Princeton undergraduate who chose to work on a project related to my research interests. At the beginning of the program he was not particularly familiar with analytic number theory; by the end he proved an original theorem in the subject. He also gave a slide presentation to the department, and his paper has been accepted for publication in a mainstream research journal. This was exciting for both of us and I look forward to many similar teaching experiences.

I should also mention several other unique teaching experiences which inform my attitude towards teaching. During two summers as an undergraduate, I was a teaching assistant for Duke University's Talent Identification Program, an intensive, three-week program for talented seventh- through tenth-graders. For two years between my undergraduate and graduate education, I taught conversational English in Japan, where my students ranged in ability from beginner to expert and in age from three to seventy, and where I was responsible for both classroom instruction and long-term planning and curriculum design. Finally, as a long-time student of karate, I have been called upon many times to teach or assist with classes. Although the relevance of these experiences may less direct, I consider them extremely important in my development as a professional teacher. In particular, I feel very prepared to step in to an unfamiliar teaching role, and to do so with confidence and élan.

In summary, I have already enjoyed a diverse teaching career, and overall I feel that I have enjoyed a lot of success in the classroom. For the most part, I believe this is due to my positive attitude and my willingness to reflect on my experiences and critically evaluate what I am doing. As a professor, I look forward to the opportunity to teach a large variety of courses, using different methods (including but not limited to: traditional lectures, seminars, computer and laboratory work, group work, and student projects), to a diverse body of students. If such opportunities do not present themselves naturally, I intend to seek them out. Good teaching will be one of the most challenging aspects of my career, and it is a challenge that I eagerly await.