Mathematics 116
Convexity and Optimization with Applications

Assignment III Due in class on Tuesday, March 1.

Announcements Sections meet Thursdays at 7pm in SC 411 and Mondays at 8pm, also in SC 411. You are welcome to either or both. We are fortunate to have as course assistants Inna (zakharev@fas) whose office hours are Sundays at 8pm in the 4th floor math lounge, and Jeff (hammerb@fas) whose office hours are Mondays at 7pm there.

Reading Continue studying chapters 2 and 3 of Sundaram's FCOT, §1.2, his Appendices, and §12.4, too. Read chapter 2 of Luenberger's OVSM. For those interested in finding out more about rigorous argument, the book *How to Read and Do Proofs* by Daniel Solow is a classic.

Exercises From FCOT §C.6: #1, #3, #4, #6, #8, #9;
From OVSM §2.16: #12, #14, #15. You may confer with friends, especially about #15, but please write up your own answers and, as always, cite all your sources (people, paper, web, etc.)

Writing In addition to handing these few paragraphs in with the other problems, you may also post your answers to the discussion section of the website (www.courses.fas.harvard.edu/~math116).

1. Write a paragraph or so explaining completeness in your own words. Include examples and say why you think this idea is significant when considering optimization problems.

2. Compare and contrast the proofs in the two texts of the completeness of C[0, 1]. Do you agree with Sundaram that his statement at the top of p. 290 is "obvious"? How could you improve this argument?

Discussion Please come to sections prepared to discuss the following questions. If you want to post your answers on the web site, please do so by Sunday.

1. How do you think the real numbers should be defined and why? Where does the Principle of Nested Closed Intervals come into the picture? Couldn't we just say the reals are the closure of the rationals?

2. Is the completion you found (at length) in problem #15 unique? What could or should this mean?

Calculus Challenge Show $ab \le \frac{a^p}{p} + \frac{b^q}{q}$ for positive a and b when $\frac{1}{p} + \frac{1}{q} = 1$ and $p>1$.