

Mathematics 116

Convexity and Optimization with Applications

Assignment IV	Due in class on Tuesday, March 8.
Announcements	Sections meet Thursdays at 7pm in SC 411 and Mondays at 8pm, also in SC 411. We are fortunate to have as course assistants Inna (zakharev@fas) whose office hours are Sundays at 8pm in the 4 th floor math lounge, and Jeff (hammerb@fas) whose office hours are Mondays at 7pm there. As always, Prof. Goroff's office hours are Tuesdays after class, from 1:30 to 3:00 or by appointment (goroff@math.harvard.edu). Be prepared for an diagnostic exercise in class soon.
Reading	Study chapter 3 of Luenberger's OVSM. For more on Least Squares, glance at chapter 4 (working through it could make a good project).
Exercises	From OVSM §3.13: #1, #3, #5, #6, #7, #12, #16. Also, show how to explicitly compute the first few Legendre polynomials as in Example 1 in §3.8 of OVSM. You may confer with friends on these assignments, but please write up your own answers and, as always, cite all your sources (people, paper, web, etc.)
Writing	<p>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).</p> <ol style="list-style-type: none">1. Explain how what Luenberger calls Fourier Series relates to the Fourier expansions on $L_2[0, 2\pi]$ that are expressed in terms of $\sin(nt)$ and $\cos(mt)$.2. Take some data, fit it with a polynomial using least squares (you may use a calculator), and discuss what is going on geometrically.
Discussion	<p>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.</p> <ol style="list-style-type: none">1. OVSM §3.13: #20.2. Is the limit of continuous functions continuous? One way to understand this question is to say that it is asking whether $\lim_{x \rightarrow y} \lim_{n \rightarrow \infty} f_n(x) = \lim_{n \rightarrow \infty} \lim_{x \rightarrow y} f_n(x)$. Many questions in analysis and in its applications boil down to whether you can exchange the order of taking limits in this way. Can you think of other examples?
Words	Vocabulary includes: orthogonal, direct sum, complete orthonormal sequence, Gram-Schmidt procedure, Fourier coefficients and series.