Syllabus for MA 310-001
Mathematical Problem Solving for Teachers
(For Elementary and Middle School Majors Only)
Spring 2009

Course: MA 310-001, TR 9:30–10:45, DH 331

Instructor: Carl Lee

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Office Hours: TR 11:00–12:15, and by appointment.

Text: Johnson, Herr, and Kysh, *Crossing the River with Dogs*, Wiley, 2008.

Course Web Page: www.ms.uky.edu/~lee/ma310sp09/ma310sp09.html

Class Attendance and Participation: This class is designed for active involvement of the students. You will be actively supporting each other as you gain experience and understanding. Multiple ideas and points of view are important. You will benefit from hearing others' approaches to problem solving, and they will benefit from you. So attendance and active participation are expected and contribute toward your grade.

Homework: There will be frequent homework assignments, usually assigned weekly. Most homework assignments will consist of problems to solve and write up, and reflections on certain techniques of problem solving.

Exams: I am planning to have either two or three exams during the semester.

Final Exam: Friday, May 8, 10:30 am, in our regular room, DH 331.

Grading:

Class attendance and participation	10%
Homework	45%
Exams	30%
Final	15%

A	90–100%
B	80–89%
C	70–79%
D	60–69%
E	0–59%

Working Together: It is OK to work together on homework. However, when it comes time for you to write up the solutions, I expect you to do this on your own, and it would be best for your own understanding if you put aside your notes from the discussions with your classmates and wrote up the solutions entirely from scratch. Working together on exams, of course, is expressly forbidden.

Absences: See *Students Rights and Responsibilities*,

www.uky.edu/StudentAffairs/Code/part2.html,

Section 5.4.2.2, for information about valid excused absences and their verification, and making up of missed assignments.

Cheating: Cheating and plagiarism can lead to significant penalties. See Sections 6.3 and 6.4 of *Student Rights and Responsibilities*,

www.uky.edu/StudentAffairs/Code/part2.html.

Expectations: I expect that everyone will maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with

basic politeness, civility, and respect for others. In particular, talking in class is OK if it's part of a class discussion or directed to me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment, or sleeping.

Suggestions: Suggestions for improvement are welcome at any time. Any concern about the course should be brought first to my attention. Further recourse is available through the offices of the Department Ombud and the Department Chair, both accessible from the Main Office in 715 Patterson Office Tower.

Course Content:

My desires are well reflected in this statement of Polya from the introduction to his book *How to Solve it*:

> A great discovery solves a great problem but there is a grain of discovery in the solution of any problem. Your problem may be modest; but if it challenges your curiosity and brings into play your inventive faculties, and if you solve it by your own means, you may experience the tension and enjoy the triumph of discovery. Such experiences at a susceptible age may create a taste for mental work and leave their imprint on mind and character for a lifetime.

> Thus, a teacher of mathematics has a great opportunity. If he fills his allotted time with drilling his students in routine operations he kills their interest, hampers their intellectual development, and misuses his opportunity. But if he challenges the curiosity of his students by setting them problems proportionate to their knowledge, and helps them to solve their problems with stimulating questions, he may give them a taste for, and some means of, independent thinking.

> Also a student whose college curriculum includes some mathematics has a singular opportunity. This opportunity is lost, of course, if he regards mathematics as a subject in which he has to earn so and so much credit and which he should forget after the final examination as quickly as possible. The opportunity may be lost even if the student has some natural talent for mathematics because he, as everybody else, must discover his talents and tastes; he cannot know that he likes raspberry pie if he has never tasted raspberry pie. He may manage to find out, however, that a mathematics problem may be as much fun as a crossword puzzle, or that vigorous mental work may be an exercise as desirable as a fast game of tennis. Having tasted the pleasure in mathematics he will not forget it

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easily and then there is a good chance that mathematics will become something for him: a hobby, or a tool of his profession, or his profession, or a great ambition.

The author remembers the time when he was a student himself, a somewhat ambitious student, eager to understand a little mathematics and physics. He listened to lectures, read books, tried to take in the solutions and facts presented, but there was a question that disturbed him again and again. "Yes, the solution seems to work, it appears to be correct; but how is it possible to invent such a solution? Yes, this experiment seems to work, this appears to be a fact; but how can people discover such facts? And how could I invent or discover such things by myself?" Today the author is teaching mathematics in a university; he thinks or hopes that some of his more eager students ask similar questions and he tries to satisfy their curiosity. Trying to understand not only the solution of this or that problem but also the motives and procedures of the solution, and trying to explain these motives and procedures to others, he was finally led to write the present book. He hopes that it will be useful to teachers who wish to develop their students' ability to solve problems, and to students who are keen on developing their own abilities.