2009-2010 GRADUATE STUDENT HANDBOOK

The faculty and staff of the Department of Mathematics take this opportunity to welcome you to the University of Oregon. We hope that your experience here will be pleasant and productive. We shall try to do our part in providing you with a solid education. However, as is true at all levels of study, the student must do the hard work of learning. If you are a teaching fellow, you have to perform the difficult role of being both a student and a teacher.

The accompanying material should answer many questions about your graduate study and teaching assignments. It should be read carefully and kept as a reference. If questions arise, do not hesitate to ask the appropriate staff member.

GRADUATE AFFAIRS COMMITTEE

- **Chair** – Dev Sinha
- **Ph.D. Subcommittee** – Ostrik, Shelton,
- **Graduate Appointments** – Ostrik, Gilkey*, Sinclair
- **Master's Subcommittee** – Vitulli*, Libeskind
- **At Large** – Isenberg, Kleshchev, Phillips, Dugger, Proudfoot, Levin
- **Graduate Advising** – Xu, Yuzvinsky*, Lin, Vitulli
- **French Exam** – Polishchuk
- **German Exam** – Phillips
- **Student Representatives**** - Tyler Kloefkorn, Liz Henning, John Jasper

*Denotes chairperson
**New student representatives will be nominated and appointed in December.

Updated 9-30-09

Table of Contents

Page

Chapter 1. General Information for All Graduate Students 3

Chapter 2. Graduate Degrees 6

Degree Programs 6
M.A. & M.S. Degrees in Mathematics 7
Doctor of Philosophy 9

Chapter 3. Information for Graduate Teaching Fellows 16

Part I. The Nature of the Appointment 16
Part II. The Mechanics of Teaching 18
Part III. The Art of Teaching 21
Part IV. General Information 24

CHAPTER 1. GENERAL INFORMATION FOR ALL GRADUATE STUDENTS

Graduate Affairs Committee

The Graduate Affairs Committee is a departmental committee that deals with all matters concerning graduate students. It consists of several faculty members and three graduate students. The student members may exercise the same rights as the faculty except that they are not allowed to participate in decisions concerning individual students or examinations. Student members are regular voting members of the committee and may raise questions, initiate departmental legislation, etc. Should you feel that there is a problem concerning the graduate program, you may bring it to the attention of the committee via one of these three student members. The graduate student members are selected by the department head from a slate elected by the graduate students during early December.

Full-Time Graduate Students

To be considered a full-time graduate student in mathematics, a graduate student must have been admitted to the graduate program in mathematics, and must register in and successfully complete a program of study as previously agreed in consultation with your official advisor. In most cases, this will involve a total of ***15 credit hours per term*** of graduate level courses, reading courses and thesis work. For students in their first year taking primarily 500-level sequences, a total of 12 credit hours per term is acceptable. Otherwise, an admitted student is considered to be a part-time graduate student. Department certification as to full-time status will conform to these rules.

The Advising Process

One of the most important responsibilities for a graduate student is to design an appropriate program of study. Thus, we insist that each student be assigned and meet with one or more advisors to help in tailoring the individual's program. Beginning students (or students returning after an absence) meet with an advising team in the fall before registration. Returning students meet with advisors in the spring. All graduate students are advised in the same way regardless of whether or not they hold a Graduate Teaching Fellowship.

New Students: Upon acceptance of admission, new graduate students will get detailed information on the relevant 500- and 600-level courses. They will be told about prerequisites, syllabi, and the books used in these courses.

The Graduate Advising Subcommittee of the Graduate Affairs Committee is charged with advising all new graduate students in mathematics. Members of this committee will meet with each new graduate student during registration week in the fall to determine a suitable program for the student. Each student is assigned an appointment with two faculty members of the Advising Committee; the schedule of appointments will be posted prior to orientation week. One of these is appointed as the official advisor of the student and should meet the student ***at least one more time during the first term*** and ***at least once in each subsequent term***, or more often if necessary, until the student forms a Ph.D. committee or leaves.

During the advising session each new student will complete a planning form that will show exactly which courses are planned for the entire year as well as specific goals the student intends to pursue. Once the program has been submitted, ***the student's advisor must approve in writing any subsequent changes to that program*** (e.g. a brief note or printout of an e-mail signed by the advisor and included in the student's official record maintained by the graduate secretary is sufficient for this purpose.)

Naturally, the student's own goals and background play important roles in the advising process. It is well worth the effort to get good advice. In addition to the advising committee, advice should be obtained from fellow graduate students and from the professors who will be teaching the courses, especially since it is often hard to decide whether to take a course at the 500- or 600-level. A 500-level course means there will be some undergraduates in the class but may be desirable if your background is weak in a particular area. A 600-level sequence tends to be demanding but is the normal preparation for the qualifying exam.

Returning Students: Current graduate students who intend to return the following year must meet with their advisors during the spring term to formulate the next year's programs. At this time they will complete a planning form and submit it to the department's graduate secretary. Once the program has been submitted, ***the student's advisor must approve in writing any subsequent changes to that program*** (e.g. a brief note or printout of an e-mail signed by the advisor and included in the student's official record maintained by the graduate secretary is sufficient for this purpose.)

At any time a student may request a change of advisors through the chair of the Graduate Affairs Committee who has the authority to appoint a new advisor. This is quite a normal occurrence. Indeed, as the mathematical interests of the student become better focused, the initial advisor may not be the best faculty member for the job. Also, if an advisor is going to be away for an extended period (a term or longer), the advisor should inform the chair of the Graduate Affairs Committee of the absence so that a replacement can be nominated.

Help! . . . Where You Can Find It

For general wisdom, a fellow graduate student is often a good source, but for specific facts, such as program requirements that change with time, it would be wise for you to verify them yourself. In most cases, start with the graduate secretary or the assistant department head. Then try an advisor or, if applicable, your course supervisor or a student member of the Graduate Affairs Committee (see front page for list of names). If the problem is really serious or if the avenues above are unsatisfactory, see the department head.

Red Tape

Advice on many of the bureaucratic aspects of being a graduate student, such as employment issues, can be obtained from the graduate secretary. Another set of red tape is the paperwork required to obtain a degree. The graduate secretary has a lot of information on these matters through the time that you receive a Master's degree. It is IMPORTANT to realize that upon advancement to Ph.D. candidacy, the department's role diminishes and the graduate school's role increases with respect to paperwork. It is important for you to take responsibility for these nitty-gritty details yourself.

Colloquia and Seminars

The colloquia are presented approximately once a week for the entire math department, and seminars are given once or twice a week in each general branch of mathematics. The phrase "for the entire math department" includes first year graduate students, and everyone is encouraged and generally expected to attend the colloquia.

Of the seminars, the "basic notions" seminar is also intended to be of broad general interest for everyone, even first year graduate students, and provides an excellent opportunity to get the flavor of some different areas of mathematics in a relaxed atmosphere.

The remaining seminars are by nature more specialized. However, attending a seminar in the field

of your choice gives you a chance to see who is working in that area and what is happening there beyond the 600-level courses.

The Math Library

The Mathematics Library is located in Fenton Hall adjacent to the Department Office. The Andrew Moursund Reading Room (Fenton 210) contains reference material and serves as an office and reading room for the library. Most of the books and journals are located in the stacks behind and upstairs from the reading room of the library. Books are one level up and journals are two levels up. The department prefers to have journals remain in the library so that they are available for reference, but a brief circulation period for copying articles is provided.

It often helpful to be able to track down a journal or book that is not on the library shelves by asking the librarian to look the item up in the catalog. However due to confidentiality regulations the librarian cannot release the name of the patron who has the item checked out unless that person has signed an official form waiving the confidentiality of their library records. Since it is so frustrating to be unable to track down a paper or book when one needs it, it is official Departmental policy that all of its members (students and faculty) should sign this confidentiality waiver.

CHAPTER 2. GRADUATE DEGREES

Degree Programs

A graduate student in mathematics will be entered into one of several post-baccalaureate programs. In summary these programs are:

A. **Non-degree Program.** Students in this program have no immediate degree objectives.

B. **Master's Program.** The objective of students in this program is a Master's degree. Students considering continuing for a Ph.D. should instead request enrollment in the Pre-Ph.D. Program.

C. **Pre-Ph.D. Program.** Students in this program are taking course work in preparation for the Qualifying Examination in order to be admitted to the Ph.D. program itself. Students spend one or two years in the Pre-Ph.D. Program, depending on prior background.

D. **Ph.D. Program.** Students are admitted to this program upon satisfaction of the Qualification Procedures. As soon as possible after admission to the Ph.D. Program, students form a Ph.D. committee, fulfill the Language Requirement and begin preparation for the Preliminary Examination.

E. **Candidacy.** Students in the Ph.D. program are admitted to candidacy upon satisfaction of the Language Requirement and passing the Preliminary Examination. The final defense of the Ph.D. thesis must take place at most three years after the student is admitted to candidacy.

The degrees Master of Arts (M.A.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) are all offered in mathematics. Specific departmental requirements for these degrees are discussed in the remainder of this chapter. General requirements of the University, including those pertaining to transferred credit, language, residence and time limits, are listed in the *Graduate School section* of the *University of Oregon Undergraduate and Graduate Bulletin* and also in the *University of Oregon Graduate Admission Bulletin*.

Each graduate student in the Mathematics Department will be evaluated in the spring quarter to determine if they are making satisfactory progress toward a graduate degree in mathematics according to the criteria listed in Article 8 of the Graduate Duties and Responsibilities Statement; see http://gradschool.uoregon.edu/?page=gdrs&id=3&unit=CAS.

- The Ph.D. Subcommittee will perform the evaluation of students who have not passed quals. It will be based on the coursework of the student in the current year and on faculty comments.

- The evaluation of students who have passed quals will be performed by their Ph.D. Committee, or by the Graduate Affairs Committee if the student's Ph.D. Committee has not yet been formed. A written record of the evaluation must be submitted to the graduate secretary for inclusion in the student's official records. The evaluation should be based on the coursework of the student in the current year and faculty comments, combined with a short written statement and/or a 15-minute presentation made by the student, as deemed appropriate by the chair of the student's Ph.D. committee. The oral examination can be regarded as a substitute for an official evaluation.

Master of Arts and Master of Science Degrees in Mathematics

Both degrees, M.A. and M.S., are offered under two programs outlined below. It is in the student's best interest to declare early which of the programs he or she intends to follow.

In summary the two Master's degree programs are:

A. **Pre-Ph.D. Master's Program**. This is the program that should be followed by those students admitted to the Pre-Ph.D. program, who intend to take the qualifying examinations for admission to the Ph.D. program at the end of their first or second year.
B. **Master's Program**. This program, sometimes referred to informally as the "terminal" Master's program, should be followed by those students seeking a Master's degree in mathematics but not intending to pursue the Ph.D.

All mathematics courses to be applied to degree requirements, including associated reading courses, must be graded[1]. Grades of C+ or below are considered to be failing grades and may not be counted towards Master's degree requirements. Also note the GTF teaching seminar does not count towards the Master's degree, nor do any other 1credit seminars such as the colloquium, the basic notions seminar, etc…

A final written or oral examination or both is required for all Master's degree candidates. This examination may be waived under circumstances described below. In order to obtain the degree, the candidate must meet with the chair of the Master's Degree Subcommittee ***before the end of the second week of the term the degree is to be received*** in order to verify that the requirements have been met and to schedule the final examination if necessary.

Pre-Ph.D. Master's Program: Only students formally admitted to the Pre-Ph.D. program may be awarded a Master's degree under the Pre-Ph.D. Master's Program. Of the required 45 credit hours, at most 15 may be approved graduate-level courses other than mathematics. Also, a maximum of 15 approved credits may be transferred towards a Master's degree.

A student must complete two 600-level sequences acceptable for the qualifying examinations in the Ph.D. program. In addition, he or she must complete either one other 600-level sequence or a combination of three terms of 600-level courses approved by the Master's Degree Subcommittee of the Graduate Affairs Committee.

The final examination may be waived if the student has performed satisfactorily on the qualifying examination, or if the GPA for all mathematics courses carrying graduate credit is at least 3.25 (B+) and the GPA for all 600-level courses (including reading) is at least 3.00 (B).

After being awarded a Master's degree, a student must file a Permission to Re-Register in the Graduate School form if planning to continue towards the Ph.D. degree. The form can be found at: http://gradschool.uoregon.edu/?page=forms.

---

1 Summer courses are the exception to this requirement; summer courses may ***only*** be taken with the grading option of pass/no pass.

Master's Program: The following course requirements and conditions must be fulfilled**.**

A. Of the required 45 credit hours:

1. At least 9 must comprise mathematics courses or seminars numbered 600 excluding 605.
2. At ***most*** 15 may be *outside* the field of mathematics.

B. Students in this program will be expected to take either two of the sequences listed below and at least one additional 600 sequence, or two 600 sequences and one of the sequences listed below:

1. Math 513, 514, 515 (Introduction to Analysis)
2. Math 531, 532, 533 (Intro to Topology & Intro to Differential Geometry)
3. Math 544, 545, 546 (Introduction to Abstract Algebra)
4. Math 551, 552, 553 (Intro to Numerical Analysis)
5. Math 564, 565, 566 (Mathematical Statistics).

Any of the following sequences will satisfy the 600-level sequence requirement[2]:

1. Math 647, 648, 649 (Abstract Algebra)
2. Math 634, 635, 636 Algebraic Topology)
3. Math 637, 638, 639 (Differential Geometry)
4. Math 616, 617, 618 (Real Analysis)
5. Math 671, 672, 673 (Theory of Probability)

In the unlikely event that none of these sequences are appropriate, the student may request an individually tailored sequence from the Masters Subcommittee of the Graduate Affairs Committee.

C. Students should have taken, at some time in their undergraduate or graduate careers, a three term upper division or graduate course in statistics, numerical analysis, computing, or other applied mathematics, or a course in another department requiring extensive application of mathematics.

At the request of the candidate the final examination may be waived if the GPA for all mathematics courses carrying graduate credit is at least 3.25 (B+) and the GPA for all 600-level courses (including reading) is at least 3.00 (B).

---

[2] Note any combination such as 616/617/515 or 647/648/546 or 643/635/533 involving some 600-level courses but at least one 500 level course counts as a 500-level sequence.

Doctor of Philosophy

Requirements for Candidacy

The Ph.D. is a degree of quality, not to be conferred in routine fashion after the completion of any specific number of courses, or after attendance in graduate school for any specific number of years. It is reserved for candidates of high potential who have demonstrated not only a comprehensive understanding of mathematics but also a measure of creative talent.

Although requirements of time and credit are secondary, every candidate must satisfy the basic requirements of the Graduate School, namely, three years of full-time study beyond the bachelor's degree, one of which must be a year in residence at the University. Thus, three years of full-time study is a necessary but not a sufficient condition.

Every Ph.D. student must take three sets of examinations (the qualifying exams, the language exam, and the preliminary exam), have the thesis approved by the members of his or her dissertation committee, and formally defend the thesis orally. Waivers of any of these requirements will be available only under the most exceptional circumstances. A student wishing to be considered for a waiver must petition the chair of the Graduate Affairs Committee ***in writing***.

Stages of the Program

There are three principal stages for a student in the process of obtaining the Ph.D. in mathematics.

- **Pre-Ph.D. Program.** This is the stage for students intending to enter the program who have not completed the qualifying procedure.
- **Ph.D. Program.** This is the stage for students who qualified for the Ph.D., and are preparing for the oral Preliminary Examination.
- **Candidacy.** Students are advanced to candidacy after satisfying the Language Requirement and passing the Preliminary Exam. At this stage students are working primarily on research and their dissertations.

The Pre-Ph.D. Program

Students entering the graduate program in Mathematics will review their previous background and their objectives with the Graduate Advising Committee. On the basis of this consultation, it will be decided whether they should spend one or two years in the Pre-Ph.D. Program before taking the Qualifying Examination.

The basic rule is that the Qualifying Examination should be taken in the September immediately following satisfactory completion of courses meeting the sequence requirements for qualification as detailed below (i.e. a minimum of two 600-level sequences and one other sequence at the 500- or 600-level).

Students spending two years in the Pre-Ph.D. Program will spend the first year taking three 500- or 600-level sequences, at most one of which is at the 600-level.

Students spending one year in the Pre-Ph.D. Program, or two-year students in their second year, will take three 500- or 600-level sequences, at least two of which are at the 600-level, so as to meet the sequence requirements for qualification detailed below.

Students initially advised to spend one year in the Pre-Ph.D. Program may decide during that year in consultation with their official advisor that it is appropriate to switch to spending two years in the Pre-Ph.D. program. In that case they should transfer to 500-level courses so that they will complete no more than one 600-level sequence by the end of the year. ***The student's advisor must give written approval of such a change to the student's program of study*** (e.g. a brief note or printout of an e-mail signed by the advisor and included in the student's official record maintained by the graduate secretary is sufficient for this purpose.)

The faculty has reached basic agreement on the meaning of grades for graduate students in the 500- and 600-level courses:

A+	Truly outstanding work
A	Good Ph.D. or M.S./M.A. level work
A-	Clearly Ph.D. level work, but below average. Good at M.S./M.A. level
B+	Work which is at the lower margin of acceptable Ph.D. level work, but quite satisfactory at the M.S./M.A. level
B	Substandard work at the Ph.D. level but satisfactory at the M.S./M.A. level
B-	Barely passing at the graduate level
C+ or below.	Unsatisfactory at the graduate level

Faculty teaching the 600-level courses shall have the option to use different (but functionally equivalent) assessment procedures to grade students who have been admitted to the Ph.D. program compared to students in the Master's/Pre-Ph.D. stage of the program.

Qualification Procedure[3]

Several criteria are used by the Graduate Affairs Committee to determine whether a Pre-Ph.D. student is "Qualified", that is, admitted to the Ph.D. Program. The steps required to become qualified are known as the Qualification Procedure.

The objective of the Qualification Procedure is to determine whether the student has mastered some important topics in higher mathematics and has sufficient mathematical ability to justify continuation in the Ph.D. Program. The criteria used to determine qualification are the following:

Criterion 1:	Satisfactory performance in all seminars or other courses taken as part of the Pre-Ph.D. Program;
Criterion 2:	Completion of three sequences meeting the sequence requirement detailed below at the level commensurate with work towards a Ph.D.;
Criterion 3:	Satisfactory performance on the Qualifying Examinations.

Sequence Requirement: The sequence requirement is intended to ensure all prospective Ph.D. students have a broad base of knowledge of mathematics as a whole. The precise requirements are as follows:

- a student must have completed at least ***one*** sequence from ***each*** of the three areas analysis/probability, topology/geometry and algebra, as listed below;
- the sequences in at least two areas must be at the 600-level;
- all courses applied to this requirement must be completed at least at the B level or above;
- the average grade in sequences applied to this requirement must be at least a B+.

---

[3] This procedure applies to all students admitted to the University of Oregon Mathematics graduate program starting in Fall 2005 or later. It does not apply to students admitted prior to Fall 2005.

The allowed sequences for each of the three areas are as follows.

AREA 1: ANALYSIS/PROBABILITY.

- 513/514/515 (Introduction to Analysis)
- 616/617/618 (Real Analysis)
- 671/672/673 (Theory of Probability)

AREA 2: GEOMETRY/TOPOLOGY.

- 531/532/533 (Introduction to Topology/Differential Geometry)
- 634/635/636 (Algebraic Topology)
- 637/638/639 (Differential Geometry)

AREA 3: ALGEBRA.

- 544/545/546 (Introduction to Abstract Algebra)
- 647/648/649 (Abstract Algebra)

Note 616/617/515, 634/635/533 and 647/648/546, or other such sequences involving one or more 500-level courses as approved by the Ph.D. Subcommittee, may also be applied to this sequence requirement but ***count as 500-level sequences*** without exception.

The Qualifying Examination: The Qualifying Examination is given the week before the start of fall term and, if necessary, the week before the start of winter term. The exam consists of two separate three-hour written examinations on two 600-level graduate sequences, which must be chosen from ***two different areas as specified above***. For example, it is not permitted to take separate exams in both analysis and probability, or in both algebraic topology and in differential geometry.

A student in the Pre-Ph.D. Program who is not admitted to the Ph.D. Program because of unsatisfactory performance on the Qualifying Examinations may take the exam a second time in the first week of the winter term. On the second try the entire Qualifying Examination must be taken even if the student's work on part of it was satisfactory the first time. A different pair of courses may be used as the basis for the second try, if approved by the Advising Committee.

A student entering the graduate program may, with the consent of the Ph.D. Subcommittee, take the Qualifying Examination the week before classes start for the fall term that he or she enters the program. Unsatisfactory performance on the examination at this stage will not affect the student's status or opportunity to take the examination in the second year of the Pre-Ph.D. Program.

The Decision Process: Shortly after the Qualifying Examination has been administered, the Graduate Affairs Committee will determine qualification using the above three criteria. Students who are deemed qualified are admitted to the Ph.D. Program. For a student who is required to try the Qualifying Examination a second time, after the second attempt, the Graduate Affairs Committee reconsiders the file and places the student in one of three categories: qualified (i.e., admitted to the Ph.D. Program), conditional, or definitely not qualified.

A decision that the student is definitely not qualified is final; such a student cannot expect to enter the Ph.D. Program at the University of Oregon.

A conditional student is asked by the Ph.D. Subcommittee to complete an additional assignment, such as an oral examination or presentation of some piece of mathematical literature. On the basis of this additional evidence, the student is then judged qualified or definitely not qualified.

The Ph.D. Program

Once a student has been admitted to the Ph.D. Program, they should begin the process of finding a suitable Ph.D. advisor in their chosen area of interest. Usually students spend one or more terms taking reading courses from potential advisors before asking that faculty member to become their official advisor.

To assist each students in finding their Ph.D. advisor, the chair of the Graduate Affairs Committee collects information each year on each faculty member. This information includes research interests, current students, plans for sabbaticals or other extended absences, etc.

The process of choosing a Ph.D. advisor is formalized by the requirement that the student turn in a Plan by week seven of the spring term of the academic year in which a student is admitted to the Ph.D. program. This short document, signed by the advisor who then serves as the chair of the students Ph.D. committee, typically lists three additional proposed members of the student's Ph.D. committee, outlines the student's plan of study for the next year, and proposes (or lists already used) materials for the first step of the language requirement as described below. Before the end of that academic year, the Ph.D. committee will meet to approve these Plans, and may suggest alternate committee members in particular if some faculty are proposed for multiple committees. It is common practice, but not required, to have one departmental member of the committee from outside the students' specialty. Students often find such a perspective helps improve the written and oral exposition of their thesis work. After advancement to candidacy (that is, the oral preliminary exam), a member of the committee from outside the mathematics department is required, by university policy.

Students are expected to take courses that will provide a satisfactory breadth of competence in higher mathematics as well as a basis for specialization. Students planning to specialize in pure mathematics are urged to complete a minor in some area of applicable mathematics, which will include one or two related year courses over the course of the student's work toward the Ph.D. degree. The Graduate Advising Committee also may review programs of Ph.D. students with reference to breadth of interests and completion of a minor.

The Ph.D. committee of a student will meet at least once a year in years after the student has advanced to candidacy. At such a meeting, which may be conducted by e-mail, the student should submit a short written statement and/or give a 15-minute presentation of the student's work as deemed appropriate by the student's Ph.D. advisor. In addition, Ph.D. students are encouraged to report on their work and readings in appropriate seminars. The results of this meeting are to be reported to the graduate secretary at a date set by the Ph.D. committee, which is not to be later than the end of the academic year.

Language Requirement

The department expects Ph.D. candidates to be able to read mathematical material in a second language selected from French, German, or Russian. The purpose of the foreign language requirement is that you learn to accurately decipher ***mathematics*** written in a foreign language.

It is expected that most students will aim to meet this language requirement during the year after passing the qualifying examination. ***At the very latest, the language requirement must be satisfied before you take the oral examination.*** If in exceptional circumstances you need to delay the language requirement until after the oral examination, you need to submit a formal petition ***in writing*** to the Ph.D. Subcommittee.

The best way to prepare for the language requirement is by reading a relevant mathematical paper or book written in the foreign language with the aid of a dictionary. A couple of hours of practice of this sort each day for a period of a few weeks should be enough to pass the language exam. It should not normally be necessary to take any additional language classes in the foreign language.

There are two steps to fulfilling the requirements:

Step 1: Set up a meeting with a faculty member of your choice who works in the area of mathematics that you wish to specialize in. For example, this could be your Ph.D. advisor if you have already formed your Ph.D. committee, or with someone who you would like to ask to become your Ph.D. advisor if you have not yet found one.

During the meeting, you should get advice as to a suitable paper or part of a book written in French, German or Russian that would be mathematically valuable for you to study. You should also be interested in the material yourself -- if you are not or if your advisor does not come up with a suitable reference, try asking someone else to get a suggestion you like better!

You should then aim to read, translate, and digest the mathematics contained in the paper or book, hopefully acquiring the necessary skill to read the foreign language while at the same time learning some useful mathematics. You should meet again with your advisor to discuss the mathematics after you are satisfied that you understand the material. When your advisor has verified that you have successfully understood the material, your advisor will sign an official form that you can get from the graduate secretary to the effect that you have completed the first part of the Language Requirement.

Step 2: When you have completed step one, you are ready to fulfill the second more formal part of the language requirement. This may be done by (1) passing a departmentally administered examination, or (2) satisfactorily completing a second-year college level language course.

In the former case, you should talk to the graduate secretary, who will put you in touch with the faculty member organizing the examination (in French, German or Russian accordingly) that year so that you can schedule the exam. Typically the examination consists of translating several pages from a book (chosen by the examiner) with the aid of a dictionary, the requirement for a pass being to correctly translate the mathematical content of the passage.

In the latter case, you should show the graduate secretary evidence to the fact that you have successfully completed the second-year college level language course.

When the both steps have been completed, you should receive a letter from the Ph.D. subcommittee confirming that you have met the language requirement. A copy of this letter should also be included in your file for future record.

Preliminary Exam

A student is advanced to Candidacy upon passing the Preliminary Examination. The student is not normally eligible to take this exam before fulfilling the Language Requirement. The Preliminary Exam should be taken no later than June of the year after the year that the candidate is admitted into the Ph.D. program. A student who has not passed the preliminary exam during their first two years in the Ph.D. Program must submit a formal petition ***in writing*** to the Graduate Affairs Committee for continuance in the program.

The Preliminary Examination is a two-hour oral examination administered by the student's Ph.D.

committee, emphasizing the basic material in the student's general area of interest. An Examination Syllabus specifying the topics to be covered in the exam should be determined by the student and the student's advisor, and be approved in writing by all members of the student's Ph.D. committee. The Syllabus may specify all or part of particular courses, textbooks, notes or published papers. It must satisfy the following general guidelines:

- ***the syllabus must not be narrowly limited to just one or two special topics;***
- ***the syllabus should represent what is absolutely needed by the student to work in their area, rather than an extensive list of commonly known topics, since a student is to be responsible for everything listed on their syllabus;***
- ***the syllabus must include material (e.g., preprints or published papers), unlike courses and textbooks, which is not primarily expository.***

After devising the syllabus in consultation with his or her committee, the student should submit a copy of the proposed syllabus to the Ph.D. Subcommittee. This Subcommittee may either approve it or require changes in the syllabus before granting approval. ***This process must be completed at least six months before the examination is administered.*** Since satisfactory progress, and thus matters such as GTF reappointments, are dependent on advancing to Candidacy, students and their advisors are strongly advised to be mindful of this deadline. A student and his or her advisor may petition to have an exam moved, but are only encouraged to do so when a students rapid progress would be best served by such a move.

It is the student's responsibility to arrange the time and place of the Preliminary Exam. The student should clear the time with his or her committee and ask the ***receptionist*** to schedule a room for the exam. Also, please inform the ***graduate secretary*** of the time and place so that she can remind the other members of the committee!

A suggested practice for final preparation in the weeks leading up to the exam is for the student to write a brief expository summary of the results from the sources in their Syllabus that they are responsible for, stating theorems, outlining proofs (with reference to their sources), and working out important examples. Producing such a document promotes the kind of synthesis which a student needs to begin research.

A student who does not pass the Preliminary Examination may petition for a second exam. The petition should be directed in writing to the chair of the Graduate Affairs Committee. It will be approved only at the discretion of the Ph.D. Subcommittee. Third exams will not be allowed.

Candidacy

A student who has passed the Language Requirement and the Preliminary Examination is advanced to candidacy for the Ph.D. Degree. At this stage the candidate's major efforts should be devoted to completion of a thesis.

As soon as possible after passing the Preliminary Examination a student should add an outside member to his or her committee. This outside member must be appointed no later than six months before the final defense of thesis. If an outside member must be changed for any reason, this must be done three months prior to the final defense.

Thesis

A Ph.D candidate must submit a thesis containing substantial original work in mathematics. Five

copies of the thesis ***must be given to the graduate secretary for distribution to the members of the examining committee no less than four weeks before the proposed time for the final oral presentation.*** The final oral presentation will not be scheduled until these copies of the thesis are in the hands of the graduate secretary. In addition, three copies of an abstract (not longer than 600 words) must be filed with the Graduate School. In the preparation of the thesis the student will be guided by the Graduate School's Style Manual for Theses and Dissertations.

The members of the thesis committee must sign that they have read and approved the final version of the thesis before it is submitted in two copies to the Graduate School.

Students working toward a Ph.D. or professional doctorate must register for a minimum total of 18 hours in Thesis (603); with department approval, up to 6 of 18 hours may be in Research (601). Credit for Thesis and Research is recorded on a P/NP basis.

Final Defense of Thesis

A formal oral defense of the Ph.D. thesis ***no later than three years after advancement to candidacy*** is mandatory. This defense will normally take place during the term in which the degree is awarded. In this defense, which shall be open to the public, the candidate will expound the major ideas and findings of the thesis and be questioned by the committee and interested parties. The Graduate School must be informed of the date of the defense at least three weeks in advance, so that a minimum of one week's public notice may be given.

WARNING:

- If the chair of the Ph.D. Committee has to be changed--it MUST be done 6 months before the oral defense.
- A student must be registered for at least 3 credit hours the term he/she plans to graduate, and the term immediately prior.

CHAPTER 3. INFORMATION FOR GRADUATE TEACHING FELLOWS

The purpose of this guide is to provide an orientation to university and department policies and to point out some of the problems faced in working day to day.

In Part I you will find a brief outline of the duties of and expectations of our GTFs. You should also be given a copy of the official Graduate Duties and Responsibilities Statement that gives a formal description of these matters.

The material in Part II is university and departmental policy, and it is expected that GTFs will follow these regulations and policies without exception.

The material in Part III is of a more subjective nature, and is simply intended to provide some helpful comments on the art of teaching, based on the experience of various persons who have contributed in one way or another to this guide.

Part IV describes some services provided to instructors by the department and other general information.

PART I. THE NATURE OF THE APPOINTMENT

Normally an instructional GTF in the Department of Mathematics will be assigned duties of one of three basic types: teaching an elementary course, assisting in recitation sections, or assisting in one or more advanced courses. General descriptions of the three types of assignments for instructional GTFs are:

1) Teaching an elementary course

- Conducting the class (usually 4 contact hours);
- Preparing lectures and exams (this may include submitting midterm exams to course coordinators well in advance of exam date;
- Holding office hours (a combined total of 4 hours per week in scheduled office hours and organized help sessions);
- Grading quizzes, midterms and final exams;
- Reading homework papers and/or supervising an assigned student grader;
- Maintaining and submitting grade records in accordance with departmental regulations;
- Assisting with preparation and proctoring of the final exam;
- Assisting with placement testing, or other duties (up to one half days per term);
- Possibly attending meetings of course instructors.

2) Assisting in recitation sections

- Assisting in recitation sections;

- Conducting discussion sections (usually 4 contact hours per week);
- Preparing for discussion sections (4 hours per week);
- Possibly preparing quizzes;
- Holding office hours (a combined total of 4 hours per week in scheduled office hours and organized help sessions is required);
- Grading quizzes and exams;
- Possibly reading homework papers and/or supervising an assigned paper marker (3-4 hours per week);
- Meeting with course instructor (1 hour per week);
- Proctoring midterm and final exams;
- Assisting with placement testing, or other duties (up to one half day per term).

3) Assisting in advanced courses

- Holding office hours (at least 4 hours per week of scheduled office hours are required);
- Reading homework papers;
- Proctoring midterm and final exams;
- Assisting with placement testing, or other duties (up to 3 half days per year);
- Working with course instructor.

A GTF should expect an average workload of 14-20 hours per week. The maximum workload is 215 hours per term for a 0.49 FTE appointment as negotiated in the Collective Bargaining Agreement between the State of Oregon and the GTFF. This agreement is detailed in the Graduate Duties and Responsibilities Statement, which all GTFs in the Department of Mathematics should be aware of; it is also available on-line at http://gradschool.uoregon.edu/?page=gdrs&id=3&unit=CAS.

Please look especially at Article 5 of this document that describes formally the appointment and reappointment process for GTFs, and Article 8, which gives the formal definition of Satisfactory Progress for graduate students in the Mathematics Department. Note the Department does not *normally* appoint GTFs for more than two years in the Masters' or Pre-PhD program, or for more than four years in the PhD program (i.e. four academic years from the year the student passes the qualifying examination inclusive).

PART II. THE MECHANICS OF TEACHING

Sources of Information

You should read the sections of the university catalog dealing with university regulations, group requirements, grading systems, etc. These are available on-line at

http://www.uoregon.edu/~uopubs/bulletin/registration_and_academi.shtml#gradesys.

For department policies and information about major requirements, courses and programs, you should also read the mathematics sections of the university catalog, available on-line at

http://www.uoregon.edu/~uopubs/bulletin/mathematics.shtml.

Refer your students to these same sources.

For advising or for information you don't have, students should be sent either to the department office or the head undergraduate advisor (you can also refer them to the undergraduate advising web-site at http://math.uoregon.edu/undergraduate for contact information).

Office Hours and Help Sessions

The time of your office hours should be announced at the beginning of the term, posted at the entrance to your office and held as scheduled. Students should also be informed of Help Sessions, which may come at more convenient times for them than your office hours. If for some reason an office hour can't be held, find a substitute or leave a note making other arrangements.

Meeting Classes

The students are paying for, and it is your responsibility to provide, a full period of mathematics instruction at every scheduled class meeting. If, because of illness or accident it is impossible to meet a class as scheduled, do not cancel it, but notify the assistant department head the day before, if possible, or at 8:00 AM the day class is scheduled. If possible, find a substitute to take your class, but if you are unable to do this, the assistant department head will try to find one for you. Of course, it helps to give us as much notice as possible and to inform the substitute of where you are in the textbook. Notify the department if you will be out of town during any working days of the term and where you can be reached if possible. This is particularly important during exam periods, in case there is a question about a grade, etc.

Course Coordinators and Textbook Committees

For each lower division mathematics course, a faculty member is appointed as course coordinator. The course coordinator will prepare a course outline, which is intended as a guide, and does not have to be followed to the letter. However, each instructor has the responsibility to cover the theory and problems in the course outline. If there is a serious departure, it may jeopardize your student's chances on the final examination in courses having a common final and leave them unprepared for the next course.

Special problems should be taken to your course coordinator, who in turn might have to consult the assistant department head or the department head. These problems include special grades, such as incompletes, and cheating.

Early in the spring the chair of the Undergraduate Affairs Committee appoints textbook committees for the basic lower division mathematics courses. Some graduate teaching fellows and faculty are appointed to these committees. These committees' primary task is to decide whether the present textbook should be retained and, if not, to select a new textbook. Such decisions necessarily involve various aspects of the course, including the course content and outline. Critical, and preferably constructive, comments on the courses or texts are welcomed by the textbook committees and course coordinators.

Examinations and Grading

(a) University Grading Policy

A detailed description of the grading policy is available in the on-line university catalog. Make sure you understand the details of the policy. Before turning in term grades, GTFs should discuss them with the course coordinator.

Basically, students elect one of two grade options, either a P/NP option, or a pass differentiated (graded), in which case of the grades to be used are A, B, C, D, or F. You may add a plus (+) or a minus (-) as the student's work warrants. The grades of F and N mean unsatisfactory performance.

(b) Grades I and Y

The grade of I (incomplete) can be given only when, for some unavoidable reason, a student, otherwise doing satisfactory work, is unable to complete all of the requirements for the course on time. When submitting a grade of I to the Registrar, the instructor must obtain from the office staff and complete an **INCOMPLETE CONTRACT** form which:

a. describes the reason for granting the incomplete;
b. describes the mechanism for removing the incomplete, including a time limit for removing it;
c. must be signed by the instructor and, if possible, the student;
d. in the case of GTFs, must have the signed approval of the Head or the Assistant Head.

Once each term the assistant head will review all outstanding grades of I; any that have not been removed within the specified time limit will be referred back to the instructor who should submit the grade change online.

Effective winter term 2005, undergraduate students have a maximum of one calendar year to make up an incomplete mark assigned by a UO instructor. Earlier deadlines may be set by the instructor, dean, or department head. Failure to make up the incomplete by the end of one calendar year will result in the mark of I automatically changing to a grade of F or N. For students graduating, removal of incompletes awarded winter term 2005 and after must be file with the Office of the Registrar by the middle of the student's term of graduation. Incompletes awarded winter term 2005 or later will be automatically changed to a grade of F or N prior to conferral of the degree. Supplemental grade changes must be filed no later than thirty days after the degree is awarded.

The grade of Y (no basis for grade) is for students registered at the end of the term, who stopped coming at some point, and did not take any of the scheduled hour exams or the final.

The special grades should not be promised or given to students without prior approval of the assistant department head or the department head. If you have cases where you feel the grades of I or Y are appropriate, bring the matter to the attention of one of the above staff.

(c) Examinations

At least one-hour exam (usually 2 or 3), several quizzes and the final exam are normally given in each class. Take-home finals are not given in lower division courses.

Copy machines are available in 218 Fenton and 110M Deady for use by GTFs in preparing teaching materials. Each GTF will receive an access code for copier use. If you are housed in Deady Hall your office key will gain you admission to the mezzanine. GTFs housed in Fenton

Hall may use the machine located in the department office.

(d) Grading and Record keeping

Each instructor is required to keep written records of grades on hour exams, quizzes and the final exam. These should be available, along with the method used to compute grades, upon request by the faculty member in charge of the course. Although there is latitude for different grading procedures, the final grades must show differentiation between the stronger and the weaker performances in the class. The student and the advisor to decide about taking more advanced courses, and in the competition for admission and graduate awards in graduate schools use grades. Grade books are kept for seven years after teaching a class because the student can challenge his grade at any time during this interval. GTFs should leave their completed grade records in the department office before finally leaving the university.

Changes of grades by GTFs should be approved by the assistant head or the head of the department. Ordinarily only arithmetic mistakes or new information such as a written excuse from a doctor, etc., are bases for changes in grades. The University of Oregon has a "Student Records Policy", copies of which are available in the department office. Paragraphs 8 and 9 of the policy are quoted below for your information and compliance.

8. Grade Books and Attendance Records

a. The grade book contains the faculty member's notations of students' progress in his class and may contain records of the students' attendance.

b. Grade books and attendance records are retained by the individual faculty member of the department or school for at least seven years after the class was taught.

9. Student's Examinations and Class Papers

a. Examinations, reports and other class papers may be retained by the faculty member only if he either:

1. Communicates to the student his intention to retain such papers at the time of assigning them; or

2. Obtains the consent of the student to retain such papers.

b. All other examinations, reports and class papers must be returned to the student in such a way as to protect the student's right to confidentiality.

(e) Returning final exams

According to the university records retention schedule all of your student's final exams should be kept in your office for at least one year after they've been given. Students must be allowed to see their completed (and graded) final and you should be prepared to go over it with them. You might, at your discretion, return a final to a student earlier. But never ***before final grades have been posted***. If you suspect a student may file a grade complaint, give him/her a Xerox copy of his/her final and retain the original.

(f) Cheating

By careful handling of the copies of exams, by seating arrangements, and by walking around the

class at times during an exam, you can make it difficult for students to cheat. On take-home work make an explicit statement as to your policy on collaborations. In case of definite evidence of cheating, report the case with all the evidence immediately to the assistant head so that appropriate action may be taken. Regulations concerning the handling of such cases are given in the Student Conduct Code.

Other Regulations

Graduate Teaching Fellows, along with all other faculty members, are subject to other university regulations, including those contained in the Administrative Code of the State System of Higher Education.

PART III. THE ART OF TEACHING

In a state university, where students from the state are more or less freely admitted, our teaching should be directed not only to the gifted student. We have a responsibility to provide a good education for the average college student, and at the same time to provide the stimulation and assistance needed by the exceptionally strong and weak students, respectively.

The First Few Weeks

Get to know the students by name if you possibly can and ask students questions by name. This establishes a relationship between the instructor and individual students.

You should announce grading and exam policies, but only after you are sure that you can maintain them, given the framework of procedures that have to be followed because of university or department policy. Your course coordinator should be able to give you guidance here. It is a good idea to remind the class of the time of the final exam and to point out that no final can be given in advance of the scheduled time. Information on the scheduling of the final examinations is in the Time Schedule.

Give a quiz or exam early; it helps to make the students feel involved in the course, and gives you and the students a quick check on how well you are getting the material across.

Preparation

Look carefully at the homework problems as well as the theoretical material to be discussed. It is embarrassing not to be able to do problems you have assigned.

Classroom Procedures, Working at the Blackboard, etc.

Most students seem to do best in elementary mathematics courses if they are involved in their classes--working problems on the board or on quizzes, answering and asking questions, participating in discussions, etc. Participation by your students is impossible if you lecture all the time. One way to combat the inviting prospect of doing all the talking yourself is to make advance assignments every day, forcing students to read the book and try to do problems before the material is explained. Then they are prepared to ask questions about things that they don't understand, and time isn't wasted by going over things that are already clear to the students from the textbook. Unfortunately, the size of most classes makes alternatives to lecturing difficult to put into practice.

Homework

There will not be enough marker available to mark all the homework you would like to assign, and it

is a big chore to grade a lot yourself. One way to avoid reliance on grading all homework is to discuss in class, either through questions by students, questions by instructors, quizzes, etc., problems of the types that have been assigned. If this is organized carefully, it does not slow down the class as much as it would appear, and can really give students a chance to develop their ideas. Experience has shown that in pre-calculus courses, students tend not to work hard enough, and are unsuccessful unless homework is assigned and some of it graded.

To get the most out of your marker's limited hours, have the marker mark four or five of the problems assigned. You should decide which four or five should be marked; select a variety of problems; problems which are particularly important or for which no answer is given. Whatever you do, ***insist that your marker return the papers promptly.*** If on occasion, your marker can't find the time for your papers, have him or her return them unmarked. The papers won't do your students any good if they are in the marker's backpack.

Applications and Problem Solving

Most of elementary calculus has its origin in physical problems. Even for students who are not taking physics or other sciences, do not ignore the powerful connections between the mathematics you teach and its applications. Learning how to set up and solve applied problems, and seeing theorems in action, can add a great deal to the interest of your class.

Relationships with Students

Even though you are concerned with more sophisticated mathematics in your own work, remember that even the material in Math 095 was at the frontier in its day. There is something interesting and exciting about even the most humble parts of elementary mathematics, and your students will respond to the interest and enthusiasm you can bring to your teaching of these subjects. Don't be disappointed if your students fail to show interest at the beginning; to *get* them interested is what teaching is all about.

Suggestions for Beginning Teachers of Mathematics

1) Don't be too ambitious. Don't expect too much. Especially don't expect students to learn proofs of any theorems unless you are teaching Math 251 or above. Courses below 251 are more computational than theoretical in nature, and your teaching should reflect this. Remember that very few of your students are prospective math majors.

2) Remember that you are presenting new material, not reviewing. Hence, a lot of repetition is in order.

3) Review often (maybe at the beginning of each period) what has been done and where you are going.

4) Don't go to class unprepared. Graduate students have a tendency to be so confident of the material that they under-prepare. This results in confusion to students. Each lesson should be well prepared, keeping in mind the type of students in the class. Remember there is a big difference between understanding and presenting material.

5) Do connect the lectures and class discussions with the textbook. Students can become quite confused if you use notation or a development of concepts that is different from one used by the textbook. If you must deviate from the book, inform them that your presentation is different and indicate whether they will be responsible for book's viewpoint.

6) Over-view the entire course at the beginning of the term to get an idea of what is coming up so that you can place the proper emphasis on the ideas that are most important in terms of future use.

7) Look over the homework problems before they are assigned. Some problems involve very messy computations and perhaps shouldn't be assigned. Be sure, in advance, that you can work any problem that you assign!

8) Don't assume that the students are able to understand all that they read in the textbook. Assume the contrary. Few students, even in 200 courses, can read and comprehend mathematics.

9) Assign some problems whose answers are not given in the back of the book. Warn students that not all the answers in the book are correct, and that sometimes the answers in the book are simplified so that students might have a correct answer but in a different form from the one used in the book.

10) At the beginning of the course be prepared to answer questions such as:

(a) Do you grade on the curve?

(b) How are grades determined? How much do quizzes count? How much does the final count? How much does homework count?

(c) Why are there any grades?

(d) Why are there so many tests?

11) Emphasize to students that success in mathematics is dependent upon practice, and that falling behind as much as three or four days is almost certainly ruinous considering the rapid rate of these courses.

12) Be careful with your responses if students pressure you to make commitments. For example, a student might ask you "If I get a B on the final, will I get a B in the course?" An unqualified affirmative response could later cause you difficulty. As another example, your class might urge you to throw out one midterm when making out the final grade. Or they might ask you to "honor dead week" by not assigning homework.

13) Be an actor! You may feel yourself teaching lower level courses in which, on some days, the material is not very exciting to you. But if your students are to become interested, you must convince them that you are interested.

14) If you have any new revolutionary ideas about how mathematics should be taught, <u>don't try them out the first year you teach</u>!

PART IV. GENERAL INFORMATION

Teaching assignments for fall term cannot be made until shortly before the term begins. For winter and spring terms, teaching assignments will be made a few weeks before the term begins. You will be given an opportunity to indicate your preference as to hours and courses. We cannot always fulfill requests, but an attempt will be made. If you have a special scheduling problem, let us know.

Each winter teaching fellows will be asked whether they wish to be reappointed for the following academic year. Requests for reappointment are considered by the Graduate Affairs Committee and decisions are normally made during spring term. Occasionally conditional reappointments are

made subject to the fulfillment of certain requirements. First year fellows making satisfactory progress toward their degree objectives are usually reappointed for a second year if it is needed to complete this objective. After the second year, reappointments are based on the students' making satisfactory progress in the doctoral program. In spring term, students who have had five years or more years of support from the department must petition the Graduate Affairs Committee for continued support the following year.

Summer teaching funds are greatly limited, but an attempt is made to give at least some support to persons who have been reappointed for the year. Seniority in the graduate program is a major criterion, however, in recent years all who requested summer support have received it. Summer teaching assignments are in the hands of the Summer School Coordinator who acts on recommendations of the Graduate Affairs Committee.

The department attempts to provide the same services to teaching fellows that it provides to any faculty member in connection with undergraduate teaching. In particular, this means that the department stands behind decisions and actions taken by instructors as part of their teaching duties if they are consistent with departmental and university policy. When in doubt about university and departmental policy, don't make firm commitments until you understand regulations that might apply.

Here are some things that your students may ask you about, but for which you are not responsible and you may send them to the head undergraduate advisor (see web site for contact details):

(a) credit-by-exam

(b) course challenges

(c) degree requirements in mathematics.

Here is another item you may be asked about:

(d) courses that students should or could take next:

Again it is not your duty to answer this sort of question (and you may send them to the head undergraduate advisor), but you will probably want to be able to answer the more straightforward questions.

Initial placement of students in lower division courses is determined by placement examinations. Math 070 is intended for students with insufficient preparation to take Math 095. Math 095 covers topics that are often presented in 1st year high school algebra courses. Math 111 is a quick course, covering topics from second year high school algebra with emphasis on functions. After Math 111 there are several options. Accordingly, the most common questions from students boil down to this: "I've had Math 111, now what?"

General Advice:

For Students who have taken Math 111 or have a placement test score above Math 111:

(a) If you eventually intend to take a year's sequence in Calculus (Math 251-3), you should begin with:

> Math 112 Elementary Functions: A study of the trigonometric, logarithmic and exponential functions; for students who have not studied these subjects in high school.

(b) If you plan to take a calculus course designed for students of the social sciences and managerial sciences you are now qualified to take:

> Math 241, 242, 243 Calculus for the Non-Physical Sciences: Not to be taken by students with credit for Math 251, 252, 253. Trigonometry is not a prerequisite.

(c) If you are a Computer Science major, you should take:

> Math 112 then
> Math 231, 232 Elements of Discrete Mathematics Covers set algebra, truth tables, graph theory, combinatorics, probability, vectors and matrices. Does not provide preparation for calculus.

(d) Finally, you are adequately prepared for Math 105, 106, 107. Any two of these courses may be combined with Math 111 to satisfy the math requirement for the Bachelor of Science.