

Department of Mathematics Graduate Student Handbook

This is written *for* graduate students *by* graduate students, and should not be interpreted as a statement of official department policy.

Version 2.2

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Chapter 1

Foreword

This guide has been prepared to assist graduate students in the Department of Mathematics. It is not a statement of official department policy, and should not be interpreted as such. The intent of this document is to provide a general outline of department policies and to answer frequently asked questions. In the event of confusion or uncertainty, specific inquiry should be made with the appropriate office or individual.

Students are also encouraged to consult the following resources:

General Information On Graduate Programs

<http://www.math.unl.edu/image/graduate/GeneralInformation.pdf>

Graduate Studies Bulletin

<http://www.unl.edu/gradstudies/current>

Master's Degree Deadlines and Forms

<http://www.unl.edu/gradstudies/current/masters.shtml>

Doctoral Degree Deadlines and Forms

<http://www.unl.edu/gradstudies/current/doctoral.shtml>

This handbook describes the academic requirements and policies for the mathematics graduate program and offers advice for meeting these requirements and adhering to these policies. Additional information on university-wide policies for graduate students can be found at <http://www.unl.edu/gradstudies/current>

This handbook also describes the responsibilities of the Graduate Teaching Assistant (GTA) and Graduate Research Assistant (GRA) in the Department of Mathematics.

Chapter 2

Department Contacts & Useful Websites

Department Chair	John Meakin	jmeakin2@unl.edu
Vice Chair	John Orr	jorr1@unl.edu
Graduate Chair	Judy Walker	jwalker7@unl.edu
Undergraduate Chair	Gordon Woodward	gwoodward1@unl.edu
Business Manager	Tom Danaher	tdanaher1@unl.edu
Systems Administrator	Rex Dieter	rdieter1@unl.edu
Computer Technician	Larissa Sazama	lsazama3@unl.edu
Main Office	Elizabeth "Liz" Yourokos	eyouroukos1@unl.edu
Teaching and UGrad Advising	Lori Mueller	lmueller2@unl.edu
Graduate and Research Assistant	Marilyn Johnson	mjohnson11@unl.edu

Table 2.1: Department contacts

University of Nebraska–Lincoln	http://www.unl.edu
Graduate College	http://www.unl.edu/gradstudies
College of Arts and Sciences	http://ascweb.unl.edu
Department of Mathematics	http://www.math.unl.edu
Office of International Student Affairs	http://www.unl.edu/iaffairs
Office of Equal Opportunity	http://www.unl.edu/equity
Student Code of Conduct	http://stuaafs.unl.edu/ja/code/
Thesis Guidelines	http://www.unl.edu/gradstudies/current

Table 2.2: Useful websites

Counseling & Psychological Services	472–5000	http://www.unl.edu/health/students/caps/
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Table 2.3: University Services

2.1 Staff Roles

The department main office is located in Avery Hall 203. The department staff is available to help with many problems and questions that may arise. The following list indicates what areas of responsibility each staff member is in charge of.

- Tom Danaher (tdanaher1@unl.edu) All financial and administrative support, questions connected to payroll, GTA appointments, office assignments, any questions connected to accounts or grants.
- Rex Dieter (rdieter1@unl.edu), Larissa Sazama (lsazama3@unl.edu) Computer systems administrators. All computer related questions.
- Elizabeth “Liz” Yourokos (eyourokos1@unl.edu) Main receptionist; travel arrangements (purchasing airline tickets, requesting funds, expense vouchers); mail, including FedEx; maintains supply inventory; recommendation letters for employment; room reservations for review sessions/exams; assistance with updating the department web pages; manages coffee and monthly phone billing; copy codes
- Lori Mueller (lmuellet2@unl.edu) Undergraduate advising; class scheduling; curriculum changes; all class rosters; calculator checkout; final exams (preparations, room assignments); Math Placement Exam (MPE); Math Resource Center (MRC); Math Day; contact for posters, flyers, brochures; assistance with updating the department web pages.
- Marilyn Johnson (mjohnson11@unl.edu) All questions connected with the Graduate program; grant proposal support/grant submissions; coordinate conferences, seminars, and workshops; assistance with updating the department web pages; main contact for purchasing.

Chapter 3

Introduction

The Department of Mathematics offers graduate programs leading to the Master of Science (MS), Master of Arts (MA), Master of Arts for Teachers (MAT), Master of Science for Teachers (MScT), and the Doctor of Philosophy (Ph.D.) in Mathematics, cf. 4. The intent of this guide is to outline the requirements and procedures for each degree program, and to provide a resource to find answers to common questions that arise while a graduate student in the Department of Mathematics at the University of Nebraska–Lincoln. This document is not intended to be a comprehensive resource, and if there is any topic that is not covered in this handbook clarification should be sought from an appropriate person, cf. 2.1

3.1 Orientation

Prior to the beginning of each Fall semester, the department offers an orientation program to incoming graduate students. This introduction incorporates university training for teaching assistants, as well as a department program for teaching assistants. There are meetings with course lecturers and conveners at this time, as well as *the mandatory department meeting* for all teaching assistants, and new students are given a general orientation to the department and its facilities.

3.2 Advising

Each incoming graduate student will be assigned a faculty adviser. Frequently the department will make an effort to assign a faculty adviser with interests similar to those indicated on the student's application for admission. The faculty adviser will assist the new student in adjusting to the department, as well as with academic planning. Students can change advisers at any time by arrangement with the appropriate faculty members. Marilyn Johnson and Judy Walker should be notified of all such changes. Upon selection of a supervisory committee and thesis adviser, the initial faculty adviser will be replaced by the student's research adviser. Students who have not yet formed a supervisory committee must complete Form Epsilon prior to the start of each semester, preferably just before you register for classes.

3.3 Graduate Student Advisory Board

The Graduate Student Advisory Board (GSAB) is an elected body of 6 ± 1 current graduate students in the department. The members include 1 first year student (elected mid-Fall), 2 second year

students, and 3 students in their third year or beyond. The term for a member consist of 2 years, at which time an election is held to fill the vacant position. Students are allowed to be elected as many times as they wish to be put on the ballot.

The purpose of the GSAB is to serve as a liaison between the department’s graduate students and the Department of Mathematics itself. If you have any concerns regarding the faculty, staff, department, or other graduate students which you don’t feel comfortable going to the administration of the department with, you can contact a GSAB member or use the anonymous drop box at <http://www.math.unl.edu/~gsab/feedback.html> and we will present your concern to them for you. The GSAB website can be found at <http://www.math.unl.edu/~gsab>. Current members are

Nathan Corwin	s-ncorwin1@math.unl.edu
Katie Morrison	s-kmorri11@math.unl.edu
Ashley Weatherwax	s-aweathe4@math.unl.edu
Molly Williams	s-mwilli34@math.unl.edu
Zahava Wilstein	s-zwilste1@math.unl.edu
Nora Youngs	s-nyoungs1@math.unl.edu

Table 3.1: GSAB Members

The Department Chair often uses the GSAB to help identify concerns the graduate students may have, and to solicit nomination for department committees. In addition to these duties, the GSAB plans at least one department function and/or one graduate student function each semester. In past years these functions have included a winter talent show and potluck dinner, ice skating, softball, and picnics.

3.4 Registration

Students register for classes using MyRed, found at <http://myred.unl.edu>. Full-time graduate students are expected to register for at least 9 credit hours per semester, and ordinarily at least six of these credit hours must be taken in mathematics courses. Tuition waivers cover up to 12 hours per semester and 12 hours during the summer.

All incoming students must register for the Landscape Seminar (Math 896) during the fall semester of their first year. This seminar meets once per week and provides an introduction to the mathematical research being done in the department. Selected faculty members will make presentations and be available for questions from students.

Students who feel that their background may be particularly weak in a subject should consult their advisor, as it is possible for incoming graduate students to enroll in some “400-level” courses, if needed to correct this deficiency. Similarly, new students who are particularly strong in a particular area may want to consider taking more advanced classes or reading courses in specific subjects, and should likewise consult with their advisor or with the Graduate Chair.

Reading courses are always available, provided interested faculty can be found to supervise them. They are recommended for students whose interests are unusual or are not frequently addressed in regularly offered courses. Summer reading courses are also recommended, and can provide students with the opportunity to “try out” a particular area of study or to broaden their mathematical horizons.

3.5 Full Time Certification

A full-time semester course load consists of nine or more credit hours. A full-time summer session course load consists of six or more credit hours.

Graduate students working on their dissertations may apply for Full Time Certification for a period no longer than twelve months in total (masters students) or twenty-four months in total (doctoral students). Full time certification allows a student to be officially full-time (thus retaining benefits such as use of the health center and loan deferments) while registered for less than nine credit hours.

To be eligible for Full Time Certification, a student must have been enrolled for four or more credit hours in the previous academic year, or have been previously Full Time certified. For more information and current requirements, please visit <http://bulletin.unl.edu/graduate/Registration>. To apply for Full Time Certification, please visit <http://www.unl.edu/gradstudies/fulltime>.

3.6 Department Committees

The department has several standing faculty committees that graduate students may need to consult. The following faculty members are serving as chair of these committees.

- Judy Walker (jwalker7@unl.edu) is the Graduate Chair, and is the chair of the Graduate Advisory Committee (GAC). Responsibilities of the Graduate Advisory Committee: Advise the Department about all aspects of the graduate program. In particular, administer the graduate program, administer the graduate exams, recruit graduate students, advise about policy issues concerning the graduate program, advise about curricular issues affecting the graduate program, serve as liaison with the Carnegie Initiative on the Doctorate Committee, administer the GAANN grants, provide recommendations for graduate student awards and scholarships, provide advice on preparing graduate students for the profession.

- Richard Rebarber (rrebarber1@unl.edu) is the Graduate Exam coordinator. The Graduate Exam coordinator is responsible for scheduling and administration of regularly offered graduate examinations. He is also the principal point of contact for students with graduate exam questions.

- Jim Lewis (wlewis1@unl.edu) is the chair of the Teaching Advisory Committee. Responsibilities of the Teaching Advisory Committee: Advise the Department and act as a resource for the Department about all aspects of teaching. In particular, mentor junior faculty, postdocs, and graduate students in teaching, promote discussions/seminars about teaching, discuss and if needed conduct peer review of teaching, advise faculty about preparation of teaching portfolios, identify nominees for faculty teaching awards.

- John Orr (jorr@math.unl.edu) is the chair of the Technology Advisory Committee. Responsibilities of the Technology Advisory Committee: Administer our math lab, oversee the work of our computer support staff, serve as a resource and advise the department on all aspects of use of technology in the classroom and in research, advise the department on issues related to our website, advise the chair on technology resource needs.

The department administers two grants that offer fellowship opportunities for students, the Mentoring Through Critical Transition Points (MCTP) grant, and the Graduate Assistants in Areas of National Need (GAANN) grant.

The steering committees for these fellowship-offering programs are:

GAANN steering committee: R. Wiegand (Chair), J. Walker, M. Walker, D. Pitts, J. Meakin

MCTP steering committee: A. Donsig, J. Lewis, D. Pitts, G. Woodward, J. Walker, J. Meakin

Chapter 4

Degrees

Graduate degree programs in the Department of Mathematics lead to the following degrees: Doctor of Philosophy (PhD), Master of Science (MS), Master of Arts (MA), Master of Arts for Teachers (MAT), and Master of Science for Teachers (MScT). Note that the Department offers both the MS and MA in Mathematics, and that the requirements for these two degrees are identical. Consequently, master's degree candidates may choose the degree title they prefer at the time they complete their *Memorandum of Courses*.

The MScT and MAT programs are designed for persons who are or will be teaching secondary mathematics. The possession of a valid secondary mathematics teaching certificate is a prerequisite to the award of the degree. For details on the program contact the Chair of the MAT-MScT Committee, David Fowler (dfowler@unlserve.unl.edu).

Students interested in a joint degree program with the Department of Computer Science are encouraged to contact the Graduate Chair for the details of this program.

Students should note that neither this handbook nor any other publication can substitute for mature, knowledgeable advice. All students are encouraged to *see their advisor* if they have any questions. That is what the advisor is there for.

4.1 Masters Degree

There are three options for programs leading to a master's degree. These are:

Option 1: Requires a thesis. The program must include 6–10 hours of Math 899 and at least 8 hours of graduate-only coursework. A member of the Graduate Faculty must act as thesis advisor. Members of the Graduate Faculty can be found at <http://research.unl.edu/gradstudies/faculty/>

Option 2: Requires a minor. Students may take a minor in any area offering the master's Degree outside the Department. Of the 36 hours required, at least 18 must be in Mathematics and at least 9 must be in the minor. The program must include at least 12 hours of graduate-only coursework. This option is not intended for students who expect to pursue a Ph.D.

Option 3: May be taken with an area of specialization in Pure Mathematics or Applied Mathematics. The program must include at least 18 hours of graduate-only coursework.

There are no specific course requirements for the Master's degree in general, although all options require a total of 36 hours of coursework. Some of this coursework must be in graduate-only courses, which are defined to be 900-level courses or 800-level courses without a 400-level counterpart. (Generally, these courses are marked with asterisks in the Graduate Studies Bulletin.)

All three options allow a minor, and Option 2 requires a minor. The choice of minor area must be approved by the student's advisor.

The *Memorandum of Courses* must be filed in the Graduate College before completion of eighteen hours of graduate credit. The form is required for candidacy and should be completed in consultation with the student's advisor. This form can be found online at <http://www.unl.edu/gradstudies/current/masters.shtml>

The *Application for a Masters Degree* must be filed at the Graduation Services Office (Canfield Administration Building 109) at the outset of the semester or session in which graduation is expected. It is found at <http://www.unl.edu/gradstudies/current/masters.shtml>. The Masters Exam cannot be completed more than 24 months prior to receipt of the degree. The student and the advisor should jointly determine the appropriate time to take the written exam. The Final Exam Report must be filed in the Graduate Office four weeks prior to the deadline for filing the final report for the degree.

4.2 Doctoral Degree

The Ph.D. program requires a Qualifying Exam, a Ph.D. Comprehensive Exam, and a Final Oral Exam. The Ph.D. requires 90 hours of graduate credit, including a dissertation. At least 45 hours must be completed at UNL after the filing of the program of studies. The Ph.D. program will normally include at least 12 hours and at most 55 hours of dissertation research. (In Mathematics, 20 to 25 hours is typical.) In addition there are specific course requirements and a language requirement.

The Mathematics Department does not have specific course requirements beyond those imposed by the Graduate College. However, students are required to consult with their advisor and to complete Form ϵ (found at <http://www.math.unl.edu/graduate/>) each semester until a supervisory committee is formed.

Before a student has earned 45 credit hours, the student forms a Ph.D. Supervisory Committee. The student must choose an advisor, who will chair the Supervisory Committee and direct the dissertation. A form listing the Ph.D. Supervisory Committee must be filed with the Graduate Studies Office. This form is at <http://www.unl.edu/gradstudies/current/doctoral.shtml>

A *Program of Studies* must be filed with Graduate Studies before the student has earned 45 credit hours; this form is completed with the advice and consent of the student's Supervisory Committee, and is at <http://www.unl.edu/gradstudies/current/doctoral.shtml>

Also, the language requirement for students in Mathematics is reading ability of one foreign language, selected from French, German or Russian. Competence may be demonstrated by either taking sufficient coursework in the language or by passing a written language examination administered by the department. The language requirement can be waived upon the recommendation of the Supervisory Committee, with approval of the Graduate Chair. The language requirement must be completed (or waived) at least seven months before the date of the Final Oral Exam.

Once a student has passed the Ph.D. Comprehensive Exam and satisfied the language requirement, the student must file the *Admission to Candidacy* form with Graduate Studies. Located at <http://www.unl.edu/gradstudies/current/doctoral.shtml>, this form must be filed no later than seven months prior to graduation. The completed form and \$25 payment should be filed with Graduation Services, Canfield Administration Building 109, before the deadline for the expected graduation term.

There must be an oral defense of the thesis, which takes place once the dissertation is written and approved by the student's committee chair and the two designated readers. The timing

of the defense will be determined by the Supervisory Committee, and the *Application for Final Oral Examination* must be filed at least three weeks prior to the defense. This form is at <http://www.unl.edu/gradstudies/current/doctoral.shtml>

4.3 Degree Timelines

This section contains information concerning timelines and task sequences that must be completed for the various degree programs.

	Task	When
1	File <i>Memorandum of Courses</i>	while > 50% of program remains
2	File <i>Application for Advanced Degree</i>	start of final semester
3	File <i>Final Examination Report for the Masters Degree</i>	four weeks before graduation

Table 4.1: Master's Degree Tasks

Year	Minimal Progress	Normal Progress	Optimal Progress
1			Qualifying Exam
2		Qualifying Exam	Comprehensive Exam
3	Qualifying Exam (5 semesters)	Comprehensive Exam	
4	Comprehensive Exam		

Table 4.2: Ph.D. Graduate Exam Completion Goals

	Task	When
1	Form/file Doctoral Supervisory Committee	prior to taking Comprehensive exams ^a
2	File <i>memorandum of courses</i>	while > 50% of program remains
3	Take Foreign Language exam	at least 1 year prior to graduation
4	File <i>Admission to Candidacy</i> form	at least 7 months prior to graduation
5	File <i>Application for Advanced degree</i>	Final semester (see deadline)
6	File <i>Application for Final Oral Examination or Waiver</i>	three weeks prior to defense

^aif the committee has not been formed prior to taking Comprehensive exams, the GAC will serve as the committee.

Table 4.3: Doctoral Degree Tasks

For doctoral students, it is imperative that the GAC be kept aware of student progress. The Graduate Chair should be regularly informed of changes. Note that *Form π* is a means of keeping the GAC aware of progress toward completion of the Comprehensive Exam. It is located at

<http://www.math.unl.edu/graduate/>, and should be submitted by the advisor at appropriate times, with copies to the Graduate Chair and the student.

Chapter 5

Exams and Course Offerings

5.1 Qualifying Exams

Entrance into the Department's Ph.D. program is determined by the Ph.D. Qualifying Exam. The qualifying exam consists of two exams over two subject areas approved by the Graduate Advisory Committee (GAC). The same exams serve as parts of both the Masters Exam and the Ph.D. Qualifying exam, though qualifying for the Ph.D. program requires a higher level of performance than passing at the Masters level. Normally each exam should be over the material covered in two courses that form a single coherent body of work. Examples of such course pairs are: algebra (817-818), analysis (825-826), differential equations (830-831), applied mathematics (842-843), combinatorics/graph theory (850-852) or topology (871-872). *One of the exams must be over the Math 825-826 sequence.* If a student expresses interest in pursuing a Ph.D. in an area that will require a substantial body of knowledge in another discipline, the GAC may approve taking the "second area exam" in a discipline outside the department.

During any examination period the student may take one or more parts of the Ph.D. Qualifying Exam. Scores on parts of the Ph.D. Qualifying Exam are valid for two years; a student need not retake a part of the Exam on which he or she earned a qualifying (Q) score, subject to the two-year limitation. A student is expected to complete the Ph.D. Qualifying Exam within two years of entering the Mathematics graduate program. Exceptions may occasionally be granted by approval of the GAC.

The qualifying exams are written and graded by a faculty committee. Each exam problem is typically graded by two independent graders, and then the scores are sent to the GAC with a recommendation regarding passing, and qualifying cutoff scores. The final decision as to whether the student has failed, passed, or qualified is made by the GAC. This decision is based upon exam performance, prior exam performance, and performance in exam cognate coursework, though the GAC is free to consider additional circumstances in rendering its decision. The GAC is to inform the candidate of its decision within a period of three weeks from the last day of the exam. For students transferring to UNL from other graduate programs, the GAC has the authority to accept exams taken at other universities.

Students can request to see their exams after grading. Students who wish to contest the grading should be advised that there will be a *very* strong burden of proof needed to sustain a grade appeal on a graduate exam, due to the nature of the exam writing and grading process. Such an appeal is most unlikely to effect any change to the exam result.

The faculty members listed in [5.1](#) are good contacts for information about the qualifying exam for each of the indicated course sequences.

Course number & Topic	Faculty
842–843 Applied Mathematics	D. Logan, T. Shores, G. Ledder
817–818 Algebra	M. Walker, R. Wiegand
825–826 Analysis	D. Pitts, M. Rammaha, D. Skoug
871–872 Topology	S. Hermiller, M. Brittenham, J. Radcliffe
830–831 Differential Equations	A. Peterson, L Erbe

Table 5.1: Qualifying exam contacts.

The following pages contain examples of syllabi for the Algebra, Analysis, Applied Math, and Topology Qualifying Exams. For further guidance concerning content of these exams, or content of other exams, contact one of the faculty members listed above, the Graduate Exam Coordinator, or the Graduate Chair. These are not intended to be a strict guideline of what is going to be on the qual, but a list of general topics you could be covering in these courses. A collection of old qualifying exams can be found at

<http://www.math.unl.edu/graduate/exams/quals/>

5.2 Algebra Syllabus

- **Basic Group Theory** Groups, subgroups, homomorphisms, isomorphisms, products, cosets, quotients.
- **Group actions** Groups acting on sets, the counting formula, permutation representations, the class equation, Sylow theorems, applications of the above.
- **Basic linear algebra** vector spaces, bases, dimension, bases for infinite dimensional spaces (Zorn's Lemma), linear transformations, eigenvectors, characteristic polynomial, orthogonal matrices, diagonalization.
- **Bilinear forms** generalities on bilinear forms over an arbitrary field, real symmetric forms, Sylvester's theorem (maybe without proof), positive definite real forms, Hermitian forms, the spectral theorem.
- **Basic ring theory** Definitions and examples, homomorphisms, ideals, quotients, integral domains and their fields of fractions, maximal ideals.
- **Factorization** UFD's, PID's, Euclidean domains, Gauss's Lemma, polynomial factorization, Eisenstein's criterion, Gaussian integers.
- **Modules** Definitions and examples, matrices, free modules, and bases over arbitrary commutative rings, diagonalization of matrices in Euclidean domains, fundamental theorem for modules over Euclidean domains (or, perhaps, more generally for modules over PID's), applications to linear operators: Jordan and rational canonical forms.
- **Basic field theory** Examples, algebraic and transcendental extensions, degree of a finite extension, multiplicativity of degrees, adjunction of roots, finite fields.
- **Introduction to Galois theory (in characteristic zero)** Definitions of Galois group and Galois field extensions, the main theorem of Galois theory, primitive elements, Kummer extensions, cyclotomic extensions, quintic polynomials.

5.3 Analysis Syllabus

- **Metric space topology:** countable and uncountable sets, including Cantor's diagonal arguments; topology of Euclidian space and metric spaces, norms and inner products; parallelogram law; compactness in terms of subsequences and open covers; the Heine-Borel theorem; connected sets;
- **Sequences and series:** convergence of sequences in metric spaces; Cauchy sequences and completeness; lim sups and lim infs; comparison, ratio, root, integral tests for convergence of series; absolute and conditional convergence; rearrangements of series; alternating series test; summation by parts;
- **Continuity of functions:** continuity and uniform continuity for functions of one or several variables; images of connected sets; intermediate value theorem; images of compact sets; extreme value theorem; monotonic functions;
- **Calculus of functions of one variable:** definition of derivative; mean value theorem; intermediate value property for derivatives; Taylor's theorem; Riemann integrals; fundamental theorem of calculus; improper integrals and Cauchy principal values; functions of bounded variation; Riemann-Stieljes integrals;
- **Sequences and series of functions:** uniform convergence; conditions for term-by-term continuity, integration, and differentiation; Weierstrass's M-test; power series and the radius of convergence; Weierstrass's approximation theorem; equicontinuity and the Arzela-Ascoli theorem;

5.4 Applied Math Syllabus

- **Dimensional Analysis and Scaling:** The Buckingham Pi theorem; Scaling
- **Perturbation Methods:** Regular perturbation; Singular perturbation, boundary layer analysis; Asymptotic expansions of integrals
- **Calculus of Variations:** Derivatives of functionals; The Euler equation; Generalizations, several functions, natural boundary conditions
- **Integral Equations:** Volterra integral equations; Fredholm integral equations with separable kernels; Symmetric kernels
- **Second-order, linear, two-point boundary value problems** Fundamental solutions second-order, linear differential operators; Green's functions for two-point boundary value problems; The self-adjoint case; eigenfunction expansions
- **Introduction to partial differential equations:** Linearity versus nonlinearity, superposition; Derivation of PDEs; conservation laws in \mathbb{R}^n , constitutive equations; The heat equation; initial and initial-boundary value problems in n space dimensions; Laplace's and Poisson's equations; boundary value problems and integral identities in n space dimensions; Solution by separation of variables; The Laplace transform; The Fourier transform on \mathbb{R}^n
- **Wave propagation:** Linear and nonlinear waves, characteristics; First-order, quasilinear conservation laws in one space dimension; Shock formation, jump condition; The wave equation, initial and initial-boundary value problems, D'Alembert's solution in one space dimension
- **Continuum mechanics in $n \leq 3$ space dimensions:** Kinematics; Conservation of mass and momentum; Application to fluid dynamics, the Navier-Stokes equations
- **Stability and Bifurcation:** One-dimensional problems; stability, classification of bifurcation points, exchange of stability; Two-dimensional problems; the phase plane, linear and nonlinear systems, bifurcation

5.5 Topology Syllabus

Point-set Topology

- **Topological spaces, continuous functions:** topology, basis, subbasis, subspace topology, product topology, quotient topology, closed sets, closure, limit points, continuous functions, Pasting Lemma.
- **Homeomorphism invariants:** separation properties (T_0 , T_1 , Hausdorff, regular, normal), countability properties, connectedness, path connectedness, compactness; local connectedness, local path connectedness, metrizability. Applications.
- **Occasional topics:** Tychonoff Theorem, limit point compactness, sequential compactness, completeness, Urysohn's Lemma, Urysohn Metrization Theorem, Tietze Extension Theorem, manifolds.

Homotopy and Homology

- **Fundamental groups and covering spaces:** homotopic maps, homotopy equivalence, cell complexes, fundamental group, induced homomorphisms, free groups, group presentations, Seifert - van Kampen Theorem, covering spaces, lifting theorems, universal covering, deck transformations, normal coverings, Galois correspondence. Applications to group theory.
- **Homology theory:** simplicial homology, singular homology, induced homomorphism, homotopy invariance, exact sequences, long exact homology sequence, relative homology, homology with coefficients, Mayer-Vietoris sequence, excision, Euler characteristic. Applications.
- **Occasional topics:** Classification of surfaces, cellular homology, higher homotopy groups, Hurewicz homomorphism.

5.6 Comprehensive Exam

The student's Ph.D. Supervisory Committee will determine the timing and the content of the Ph.D. Comprehensive Exam. Consequently, the student is strongly advised to form a Supervisory Committee before taking any components of the exam. The GAC serves as the default Ph.D. Supervisory Committee for students who have qualified for the Ph.D. program but have not yet formed a Ph.D. Supervisory Committee. The Supervisory Committee is required to follow Graduate College rules regarding the Comprehensive Exam, which may be found online at

http://bulletin.unl.edu/graduate/Doctoral_Degree_Requirements#Comprehensive_Examination_and_Admission_to_Candidacy.

By common agreement of the Graduate Faculty, the Ph.D. Comprehensive Exam will consist of at least the following parts:

Part I: One of the following (a) A four-hour written exam in algebra over the material usually covered in Math 901–902. Recent text: Lang, Algebra. Additional References: Hungerford, Algebra; Dummit and Foote, Algebra; Kaplansky, Fields and Rings.

(b) A four-hour written exam in analysis based on the material usually covered in Math 921–922. Recent text: Royden, Real Analysis. Additional References: Rudin, Real and Complex Analysis; Folland, Real Analysis.

Part II: A four-hour written exam or a two-hour oral exam administered by the Supervisory Committee, to test the student's breadth of understanding of the field of knowledge of which his/her special subject is a part.

A student may fulfill both **I** and **II** by completing both **Ia** and **Ib**. A student who has used a course sequence (e.g. Math 901–902 or Math 921–922) to complete a portion of the Qualifying Examination cannot use it again as a portion of the Comprehensive Examination.

As with the Qualifying Exam, the "standard" Comprehensive Exams are written and graded by committee and a recommendation is made to the student's Supervisory Committee. The decision as to whether or not the student has passed the Comprehensive Exam, and if not, which part(s) of the exam must be repeated, rests with the Supervisory Committee.

Very few students take one of the standard Comprehensive Exams without enrolling in the appropriate course sequence. Any student who wishes to take one of these exams without enrolling in the cognate course should contact their Supervisory Committee or the Graduate Chair to determine the suitability of this course of action. Examples of old Comprehensive Exams are located online at <http://www.math.unl.edu/graduate/exams/comps/>

5.7 Language Exams

Ph.D. students must satisfy the Language requirement in one of the following three ways:

1. Passing an exam in the language(French, German, or Russian) administered by the Foreign Language Committee of the Mathematics Department.

2. Completion of at least one advanced course (at the level of French 202, German 202, or Russian 202 or beyond) in the language with a grade of B or above.
3. Passing the Educational Testing Service exam as administered at the University of Nebraska or as administered at another university (with a grade of 500 or more).

The following faculty members are the language examiners for the department and should be consulted for description of a typical language exam:

French	Allan Donsig	adonsig1@unl.edu
German	Lynn Erbe	lerbe2@unl.edu
Russian	Steve Cohn	scohn1@unl.edu

Table 5.2: Language Exam

The Language Requirement can be waived upon the recommendation of the Supervisory Committee, with the approval of the Graduate Chair. This can only be done with proper justification such as substituting graduate level courses in another department on a topic that is directly related to the student's research area. It is important to note that the Language Requirement must be completed or waived at least seven months before the date of the Final Oral Exam.

5.8 Course Offerings

The following table gives the typical scheduling for regularly-offered graduate courses. Other courses are offered on an irregular basis based partly on student and faculty interest.

Course Number & Topic	Offered
817–818 Introduction Algebra	Yearly
825–826 Mathematical Analysis	Yearly
830–831 ODE	Odd years
842–843 Applied Math	Yearly
850–852 Discrete Math	Yearly
871–872 Topology	Yearly
901–902 Algebra	Yearly
921–922 Real Analysis	Yearly
924–925 Complex Analysis	Even years
928–929 Functional Analysis	Odd years
932–933 Advanced ODE	Even years
935–936 Advanced Applied Math	Even years

Table 5.3: Typical Course Offerings

Other courses that have recently been offered with some frequency include Algebraic Geometry, Commutative Algebra, Differential Topology, Group Theory, Mathematical Biology, Numerical Analysis and Partial Differential Equations.

Chapter 6

Assistantships

Most graduate students in the Department of Mathematics are financially supported by means of teaching assistantships. This section discusses some of the terms and duties of this type of support.

Some students are supported with fellowships. These fellowships may be awarded by the department, the university, or by external sources. Information on university and external fellowships is available at <http://www.unl.edu/gradstudies/current/funding.shtml>. The Mathematics Department administers the MCTP and GAANN grants and there are usually several fellowships available each year from these programs. Additionally, there are often mathematics students supported by Project Fulcrum, which is administered by the Physics Department (see <http://www.physics.unl.edu/~fulcrum>). The application deadline for most university-affiliated fellowships usually falls around February 1.

6.1 Appointment and Reappointment

There are three teaching appointments offered by the department. The Full-Time Equivalence (FTE), compensation, and number of contact hours for each appointment are shown below.

GTA compensation is determined by two factors. The first is teaching load, measured in full-time equivalence (FTE). The second is progress toward the PhD, measured by the passing of the Qualifying and the Comprehensive Exams.

These amounts are for the 10 month academic year running from August until May. Summer funding follows a different schedule and largely depends upon the source of the support and the nature of the work assignment. The amount of summer support is generally between \$2,600 and \$4,000.

Paychecks are distributed monthly, August through May, on the last business day of the month. Federal and state taxes are withheld, but so long as the student is carrying enough credit hours of classes, no FICA (Social Security) is withheld. The university pays 80% of the student health insurance premium for those students who are enrolled in the health plan. Students who have another source of health insurance and do not want to be enrolled should contact Tom Danaher.

The remaining 20% of the health insurance premium is added to your student bill.

FTE	Base Pay (\$)	Typical Duties
0.33	15,100	4 contact hours fall semester; 4 contact hours spring semester
0.37	15,700	6 contact hours fall semester; 3 contact hours spring semester
0.49	19,000	6 contact hours fall semester; 6 contact hours spring semester

Benchmark	Additional Pay (\$)
Completed Qualifying Exams	600
Completed Comprehensive Exams	1,200

Contact Hours	Average equivalent hours/week commitment
3	10–12
4	13–15
6	20

Table 6.1: Pay Scale for GTAs

In order to be allowed to teach, a student from a country where English is not the native language must attend the Institute for International Teaching Assistants (ITA), an intensive three-week program running from late July to mid-August. (In order to be admitted to the ITA, the student must score at least 45 on a SPEAK test.) At the end of the ITA, the student must pass a “final panel.” An International Student who does not pass the final panel of the ITA will be hired as a grader at a substantially lower salary than the GTA stipend.

New GTAs are typically assigned calculus recitations. After the first year they generally have complete charge of their courses. These will usually be a variety of precalculus courses during the second and third years. More advanced GTAs teach calculus, contemporary mathematics, and courses in arithmetic and geometry for elementary teachers. Summer teaching positions are usually available. Students whose teaching performance is adequate and who are making satisfactory progress toward their degree can expect continued support for five to six years (with possible further support under certain circumstances).

Initially, satisfactory progress is determined by the GAC, largely based upon qualifying exam performance and course grades. Upon the establishment of a supervisory committee, the GAC and this committee will determine satisfactory performance based largely upon comprehensive exam performance, course grades, and adviser’s recommendation. After completion of the comprehensive exam, the supervisory committee has primary responsibility for determining sufficient progress, though the GAC will be interested in timely achievement of certain key tasks, including the discharge of the language requirement and advancement to candidacy.

Usually John Orr sends out a request form to all teaching assistants toward the end of the semester on which you can request to teach specific classes for the following semester. It is good to develop your teaching résumé, but be careful what you ask for, since you might get it. Some classes are more difficult to teach than others, and this should be considered in conjunction with the difficulty of your own classes when requesting a teaching assignment. Also, some GTAs are assigned grading duties in addition to, or in

leiu of, their teaching duties.

6.2 Duties

The duties associated with being a GTA in the Department of Mathematics can be split into two areas: teaching duties and department duties. Be aware that GTA duties during summers sometimes differ from normal duties during the school year. See Chapter 7 on summers for more information.

6.2.1 Teaching Duties

Teaching assistants generally have appointments of 0.33, 0.37, or 0.49-FTE with workloads as described in Section 6.1. While some teaching assistants will grade for other classes, almost all graduate students will have teaching assignments in one of the following courses:

Course Number & Description		Class Time (hours)
Math 100A	Intermediate Algebra	3
Math 101	College Algebra	3
Math 102	Trigonometry	2
Math 103	College Algebra and Trigonometry	5
Math 106	Calculus I (Recitation)	2
Math 107	Calculus II (Recitation)	2
Math 203	Contemporary Mathematics	3

Table 6.2: Typical GTA Teaching Duties

With the exception of recitations, you will be responsible for all aspects of teaching these courses, from preparing and delivering lectures to writing and grading tests and quizzes. Each of the courses listed above has a convener who is in charge of making a syllabus for the course, and from which the unit final exam will be written (Math 203 does not have a final exam). The convener is also responsible for making the final exam. If you have questions about any of the material that is listed on the syllabus you should discuss this with the convener. Advanced graduate students who have taught classes before may be asked to serve as the convener for the courses listed above. For more information on being a convener see 6.2.2.

Advanced graduate students, and those with previous teaching experience may be asked to teach one of the following courses:

Course Number & Description		Class Time (hours)
Math 104	Business Calculus	3
Math 106	Calculus 106 (Lecture)	3
Math 208	Calculus III	4
Math 221	Differential Equation	3
Math 314	Matrix Theory	3

Those teaching Math 221 and Math 314 will also be responsible for making their own final exams.

For those GTA's whose first teaching assignment is Math 100A or Math 101, you are required to attend a one day teaching seminar/workshop presented by Cheryl Kane. You only need to attend the seminar prior to the semester in which you teach your first class. The department will inform you as to when this seminar/workshop is run. For those GTA's whose first teaching assignment is something other than Math 100A or Math 101, you should meet with the course convener. (For those students who are teaching their first course during the summer session you should contact Lori Mueller and ask for copies of the syllabus from the last semester, and if possible any course guidelines that should be addressed; see Chapter 7.) For additional help on teaching style or technique you can contact the Graduate Studies Office, see Section 8.1.1.

As a GTA, you are *never*, under any circumstances, to cancel your class. If you are unable to make it to your class YOU are responsible for finding someone to cover your class. If you are unable to find a replacement, contact Lori Mueller or John Orr as soon as possible. In a similar manner, you are not allowed to sign overrides to grant students permission to enroll in your class. All students must apply for an override by submitting the override form to the main office (Avery Hall 203). On the first day of classes you may find drop letters in your mailbox. These letters are to be delivered to the students during the first week of classes. They outline why the student is being dropped from the course. The reasons for this are either not having passed a prerequisite course, or not qualifying via the Math Placement Exam. You should deliver these letters every day of class during the first week.

Final Exams

Those GTAs that are teaching Math 100A, 101, 102, 103, 104, 106, 107, or Math 208 will have a unit final. That is, the conveners of each course will write a final exam that all students in that course will take. The unit finals are always scheduled from 6-8 p.m. during finals week, and all the students in the above mentioned courses will be taking their finals on the same day. (The exact day is always known prior to the start of the semester and will be stated on the syllabus.) If for some reason a student is unable to make the unit final they must inform Lori Mueller or John Orr as soon as possible to schedule an alternate exam. You are not allowed to let a student take the final exam early. Grading duties for the final exam are assigned by the convener and grading should be completed in a timely fashion.

Course materials should be kept for at least one year after completion of the course. Please do not dispose of final exams yourself; bring them to Lori Mueller, who can make sure that social security numbers are taken care of as they should be. The main office can also dispose of any other old course materials you have, if you don't want to check for names and social security numbers.

6.2.2 GTA Conveners

GTA's may on occasion be asked to serve as a convener for Math 102 or Math 103. As a convener, it is their duty to write a master syllabus for all the sections of the course they are

teaching. In addition to the syllabus, they should meet with all the other GTA's teaching that course to discuss what policies should be followed, e.g. whether or not there will be quizzes, how many tests will be given, whether there will be projects, if there will be low quiz scores drop, total number of points available, etc. **These policies should be uniform over all the sections of that course.** Conveners are also responsible for writing the final exam, and an alternate final exam. It is suggested that you ask the other instructors for problems that should be included on the final exam so as to ease the burden of writing the entire final exam yourself. After the exam has been written a copy should be sent to Lori Mueller so that it can be photocopied for all the sections. You should also make up grading assignments for final exam and notify the other instructors of their grading assignment.

6.2.3 Departmental Duties

As a Graduate Teaching Assistant, your duties to the department include, but are not limited to, teaching your assigned course or courses and/or grading for other courses as per your appointment/reappointment contract, making yourself available for scheduled office hours, serving as a counselor in the Math Resource Center (MRC) and performing any other service as agreed upon by you and the department chair (or other department administrator). Your time in the MRC is not to be counted as your only office hours. You are required to have office hours outside of the time that you are in the MRC.

Unless otherwise stated in your contract, as a GTA you are required to serve as a counselor in the MRC two hours a week during either the Fall or Spring semester. As a counselor you are to assist students with questions that they may have in the courses listed in the previous section.

Every year the department hosts Math Day, a mathematics competition for high schools across Nebraska. You are encouraged to volunteer to help out with Math Day in some manner. The department will distribute sign up sheets to your mailbox several weeks in advance. To volunteer return the sheet to Lori Mueller's mailbox indicating at what times you will be able to help.

Chapter 7

Summers

Summers are different than the rest of the academic year. Expectations, classes, and teaching during the summer differ substantially from those during the year, and so it is important to be aware of what is different and what remains the same.

7.1 Classes

Course offerings are slim pickings during the summer. If none of the summer classes look like your cup of tea, faculty are often willing to do a reading course with you. However, they may travel a lot or otherwise fill up their summer schedule, so it is in your best interest to start making inquiries as soon as possible.

GAANN trainees are required to be registered during both summer sessions, though MCTP trainees are not.

Keep in mind that people are pretty flexible in the summer. If you can't be here for the first week of first session and the last week of second session, hope is not lost for taking a class. Faculty will often work with you to find something that works for both of you. However, the sessions in which you teach and are registered for your own class(es) must coincide!

7.2 Teaching

Photocopying: Due to summer session budget constraints, you should bring all copy jobs to the main office at least 24 hours in advance of when you need the copies. All copying for class use must be copied on a summer session copy number and **not** the copy number you have been assigned for Fall and Spring courses, or else the department will not get reimbursed correctly.

Syllabus and Book: You should receive an email before each summer session starts with a template syllabus from the previous summer. Update dates of lectures, Gateway exams (if applicable), MRC/Math Lab hours, Math Placement policy and readiness requirements, and the final exam date, and return it to Lori Mueller for proofing before any photocopying is done to ensure that all required University and Department verbiage is included. You may also contact Lori Mueller as soon as you have been notified of your summer teaching assignment for the syllabus template.

MRC: The Math Resources Center is available during the summer. See <http://www.math.unl.edu/resources/undergraduate/mrc> for the scheduled summer hours and location. This information must be advertised to your students via your class syllabus.

Computer exams/HW: Math 102, 106, and 107 require the Gateway exam as part of the course curriculum. If you are teaching one of these courses, you must contact Rex Dieter to let him know what dates you have chosen to have the Gateway exam made available to your students. He will publish these dates on the departments' Gateway Exam webpage with a link for your students to access it. You will be required to create your own Gateway Administration Folder; ask Rex Dieter for written instructions on how to do this. The Gateway exam can be proctored in our Math lab (18 Avery Hall) or the Arts and Sciences Testing Center (127 Burnett Hall).

Currently, Math 100A and 101 are not requiring MathXL during the summer.

Projects: Courses that have projects during the school year may not have projects during the summer. Talk to Lori Mueller, John Orr, or Gordon Woodward to see if yours does.

Final Exams: During the summer sessions, there is no common final exam. You are required to write your own or get together with other instructors teaching the same course and write it together. All alternate final exam requests must be forwarded to Lori Mueller for approval. The department rule stands strong that no final exam will be administered prior to the scheduled final exam date and time. In case one of your students is approved for an alternate final exam, you are responsible for writing the alternate final exam.

Guidance/Conveners: There is no "Super TA" in the summer. If you have any questions or concerns about your course before or during the session, ask your section lecturer (for reci instructors), Lori Mueller, John Orr, or Gordon Woodward.

Pay: If you work first session, you get paid during June and July. If you work second session, you get paid during July and August, and so you will not be getting paid in June. Plan ahead!

Furthermore, while you are not required to register for a class while teaching, there are a few tax benefits, and university facility benefits to doing so. See Tom Danaher or Marilyn Johnson for more information.

Chapter 8

Preparing for Graduation

8.1 Professional Development

Whether your academic goals are to obtain a masters degree or a Ph.D. degree, the University and department will assist you in your development. The Graduate College and the office of Graduate Studies offers many programs to help graduate students. The Graduate Student Academic and Professional Development program offered by Graduate Studies can help graduate students explore the various academic and nonacademic career paths available to the them. They work with UNL Career Services and UNL faculty to provide resources and materials in

- basics of an effective cover letter
- cover letter do's and don'ts
- Curriculum Vitæ (CV)
- effective interview strategies
- delivering the "job talk"
- job search strategies

For those students pursuing a Ph.D. the department offers two seminars related to these topics. The Academic Job search workshop, and the Professional Development seminar. The Academic Job Search workshop is offered in the fall semester and students are encouraged to take it the year prior to their graduation. The Professional Development Seminar is offered in the spring semester and students are encouraged to participate in this a year prior to graduation as well. While much of the materials presented in these programs is geared toward the academic profession, those pursuing non-academic jobs are encouraged to participate.

8.1.1 Graduate Studies Teaching Services

In addition to these programs, the Graduate Studies office offers many other services to assist graduate students with their teaching duties. Among these are an annual workshop held during the fall semester. Graduate Studies also offers individual consultation on teaching. They will observe/videotape your classes and offer suggestions that may help improve your teaching.

8.2 Applying for jobs

As a service for those students who are graduating with a Ph.D. the department will mail all application materials free of charge. Materials must be given to the department within a reasonable time frame. To have materials mailed you should supply the department with the following information:

- Address labels or a Word document or PDF file with the address labels formatted
- Cover letters, CVs, and other relevant documents
- Names of people writing recommendation letters
- The items that should be included in each application along with the deadline

8.3 Graduation forms

Make sure that you obtain a copy of the degree forms deadlines from either the Graduate Studies website <http://www.unl.edu/gradstudies/current/doctoral.shtml> or from the Graduation Services office in Canfield Administration Building. Almost all of the forms that you need will be downloadable from the Graduate Studies webpage.

8.4 Post-Graduation

Upon your departure from the department, you will need to supply Lori Mueller with copies of **ALL** your grade books, and also the final exams from the last semester you taught. Along with these grade books you should include any and all documents that pertain to your grading scales as well as any other information that might be useful in a grading appeal. You are also asked to complete an AMS questionnaire that Marilyn Johnson will give you.

Chapter 9

University Policy

9.1 Policy and Procedures on Unlawful Discrimination

See <http://bf.unl.edu/hrpolicy/OtherPolicies.shtml> for complete details.

The University of Nebraska–Lincoln (UNL) has an institutional obligation to provide a place where persons can work and study free of illegal discrimination. More specific aspects of that obligation are defined by Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, the Rehabilitation Act of 1978, the Americans with Disabilities Act of 1990, and the Age Discrimination in Employment Act, among other federal and state laws, agency regulations and judicial interpretations. University officials have a duty to promptly investigate and take appropriate action on all known incidents of illegal discrimination.

In addition to its legal obligations, UNL is a community which, within legal restraints, may establish norms of behavior to govern the interaction of individuals within the community. These norms may, and often do, go beyond enforcement of any legal obligation established for the University as an institution.

The UNL seeks to achieve a working and learning environment that is open to all people. Diversity is one hallmark of great institutions of learning and has long been one of the strengths of our society. Dignity and respect for all in the UNL community is the responsibility of each individual member of the community. The realization of that responsibility across the campus is critical to UNL's success.

UNL has a policy of equal educational and employment opportunities and of nondiscrimination in the classroom and workplace. Educational programs, support services and workplace behavior, including decisions regarding hiring, promotion, discipline, termination and all other terms and conditions of employment, should be made without discrimination on the basis of race, color, religion, sex, national origin, age, disability, veteran status, marital status or sexual orientation. No person should be subject to retaliation for seeking a review of a complaint of discrimination, for participating in an investigation of such a complaint, or for seeking redress for discrimination.

9.2 Student Code of Conduct: Academic Dishonesty

Taken from the 2005–2006 Undergraduate Bulletin. The entire bulletin can be found at <http://www.unl.edu/unlpub/undergrad>

The maintenance of academic honesty and integrity is a vital concern of the University community. Any student found guilty of academic dishonesty shall be subject to both academic and disciplinary sanctions. Academic dishonesty includes, but is not limited to, the following:

1. Cheating. Copying or attempting to copy from an academic test or examination of another student; using or attempting to use unauthorized materials, information, notes, study aids or other devices for an academic test, examination or exercise; engaging or attempting to engage the assistance of another individual in misrepresenting the academic performance of a student; or communicating information in an unauthorized manner to another person for an academic test, examination or exercise.
2. Fabrication and Falsification. Falsifying or fabricating any information or citation in any academic exercise, work, speech, test or examination. Falsification is the alteration of information, while fabrication is the invention or counterfeiting of information.
3. Plagiarism. Presenting the work of another as one's own (i.e., without proper acknowledgment of the source) and submitting examinations, theses, reports, speeches, drawings, laboratory notes or other academic work in whole or in part as one's own when such work has been prepared by another person or copied from another person.
4. Abuse of Academic Materials. Destroying, defacing, stealing, or making inaccessible library or other academic resource material.
5. Complicity in Academic Dishonesty. Helping or attempting to help another student to commit an act of academic dishonesty.
6. Falsifying Grade Reports. Changing or destroying grades, scores or markings on an examination or in an instructor's records.
7. Misrepresentation to Avoid Academic Work. Misrepresentation by fabricating an otherwise justifiable excuse such as illness, injury, accident, etc., in order to avoid or delay timely submission of academic work or to avoid or delay the taking of a test or examination.
8. Other. Academic units and members of the faculty may prescribe and give students prior notice of additional standards of conduct for academic honesty in a particular course, and violation of any such standard of conduct shall constitute misconduct under the Student Code of Conduct and the University Disciplinary Procedures.

Chapter 10

Department Policy

10.1 Policy and Procedures on Discrimination and Harassment

Sent to the department on August 22, 2006 by John Meakin, Chair.

As we begin a new academic year, I want to bring to your attention some basic institutional and departmental policies regarding discrimination, including sexual harassment and other forms of harassment. The university has a detailed statement *University of Nebraska-Lincoln Policy and Procedures on Unlawful Discrimination, including Sexual and other Prohibited Harassment*, that may be found on the UNL website at <http://www.unl.edu/pr/policy.html>.

It is critical to the success of the mission of the University and of our Department, that we all understand and respect these policies and procedures, especially with regard to our relationships with our students, colleagues, and co-workers. Let me quote and comment on just a few sentences from the UNL document:

1.1 Introduction. The University of Nebraska–Lincoln (UNL) seeks to achieve a working and learning environment that is open to all people. Diversity is one hallmark of great institutions of learning and has long been one of the strengths of our society. Dignity and respect for all in the UNL community is the responsibility of each individual member of the community. The realization of that responsibility across the campus is critical to UNL’s success.

Comment: Our department fully embraces this goal. It is our aim to create an environment that enhances the learning and professional development of all of our faculty, staff, and students and that respects diversity of ideas and people. It is the responsibility of all members of our department to ensure that this goal is achieved. Please be sensitive to this goal in your dealings with our staff, faculty, and graduate students, and with undergraduate students in classes that you are teaching.

4.1.1. Discrimination: The University of Nebraska–Lincoln shall not discriminate based upon race, color, religion, sex, national origin, age, disability, veteran status, marital status or sexual orientation.

Comment: Our department fully embraces this goal. Please bring to my attention

any instances of discrimination in the workplace, or in dealings between instructors and students, either in or out of the classroom.

4.1.2. Discrimination in the Form of Sexual Harassment: It is the policy of the University of Nebraska-Lincoln that no member of the UNL community may sexually harass another. Sexual harassment is a form of discrimination based upon gender. It is prohibited at UNL and is subject to the procedures and sanctions contained in this policy.

Comment: Our department has a zero tolerance policy towards sexual harassment. Sexual harassment may be physical, verbal, or emotional. Sexual harassment can occur in a variety of circumstances, including but not limited to the following: The victim as well as the harasser may be a woman or a man. The victim and the harasser do not have to be of the opposite sex. The victim does not have to be the person harassed but could be anyone affected by the offensive conduct. The harasser's conduct must be unwelcome. Please bring to my attention any instances of sexual harassment, either in the workplace, in the classroom, or in relations between instructors and students.

4.2. Consensual and Domestic Relationships. UNL policy requires recusal (the relinquishment of the supervisory role) when supervisory or evaluative relationships exist between members of the university community who share sexual, romantic, or domestic relationships. This policy covers, but is not limited to, persons in the following professional relationships: line officers and faculty; faculty and students; tenured and non-tenured faculty; graduate assistants and students; supervisors and the employees they supervise; and student or employee and administrator, coach, advisor, counselor, or residential staff member who has supervisory responsibility for that student or employee.

Comments: While UNL certainly does not seek to inhibit consensual and domestic relationships between people, it does seek to remove a power differential that makes mutual consent inherently suspect and that raises questions of conflict of interest. This has particular implications about relationships between people in our academic environment. Ideally, instructors should avoid becoming involved in a consensual relationship with any student in a class they are teaching.

If a faculty member believes that the potential for a consensual relationship exists with a graduate student or an undergraduate student in the department, the faculty member has a responsibility to notify me as soon as possible about the relationship. I will take all possible steps to ensure that the faculty member does not have any duties or responsibilities that result in a position of power over the student and that there is no perception of preferential treatment of the student as a result of the relationship.

If a graduate student (or a lecturer, or an undergraduate student with instructional responsibility) believes that the potential for a consensual relationship exists with a student in a class he or she is assigned to teach, the instructor has the responsibility to notify me about this as soon as possible. If necessary I will find a way to reassign the instructor's duties for the semester so that the instructor and the student in his or her class are not put in a position of either apparent or real conflict of interest.

Appendix A

Purpose of a Doctorate in Mathematics

As said in the University of Nebraska-Lincoln Mathematics Department work under the Carnegie Initiative on the Doctorate,

The purpose of doctoral education in mathematics is to produce the next generation of mathematicians who will advance mathematical research and maintain the integrity and vitality of the discipline. Doctoral graduates in mathematics should become stewards of the discipline, people who are entrusted with preserving and developing the mathematical literature and with communicating mathematical knowledge to others.

A doctoral graduate in mathematics should have a deep active knowledge of some area of mathematics, and should have made a significant contribution to the literature in that area. In addition, doctoral graduates in mathematics should possess:

- a broad knowledge of the mathematical literature, its historical development, and how diverse parts of mathematics relate to each other;
- a general understanding of the centrality of mathematics in society, and the interrelations between mathematics and other disciplines;
- preparation and skill to teach mathematics at different levels;
- an understanding of and commitment to the ethical principles that underlie professional work in the discipline of mathematics;
- a sense of membership in the community of current and former mathematical scholars, and an understanding of the historical roots of this community;
- a commitment to the profession, engaging in professional service, both within the graduates immediate community, and within the broader community of mathematical scholars;
- the ability to communicate the beauty and power of mathematical ideas to diverse audiences;
- the ability to help others learn to combine creativity and imagination with the rigor, logic, and precision of mathematics.

Essential to the notion of stewardship of the discipline is that a doctoral graduate should have a sense of shared ownership of the body of mathematical ideas, and a sense of responsibility to preserve, develop, and enhance the understanding of these ideas. This can be accomplished through research contributions that advance the boundaries of knowledge in the discipline, through educating, nurturing and inspiring a new generation of students, through professional service to the discipline, and through contributions that

advance the interaction between mathematics and other disciplines.

Doctoral and postdoctoral education should produce scholars who are prepared for a variety of careers that utilize their mathematical knowledge. Ideally, the doctoral granting institution will continue to mentor its graduates long after they have embarked on their careers. Doctoral graduates should leave their graduate institutions with an appreciation that they belong to a community of mathematicians who share a responsibility to be stewards of their discipline and to communicate mathematical ideas to others. Many scholars choose academic careers; others choose careers in business, industry or government.

- **Academic careers in doctoral granting departments**

Those who pursue academic careers in research-intensive, doctoral granting departments should develop a deep technical and historical understanding of the literature in their area and should continue to make research contributions to this literature that are judged significant by their peers. They should develop a general understanding of the role and significance of the literature in their area as it relates to the overall mathematical literature and the literature in related disciplines. They should develop a sense of responsibility for maintaining the integrity and vitality of their area, for communicating mathematical knowledge effectively to a broad audience of students, professionals, and the general community, and for educating and inspiring the next generation of mathematicians and mathematically literate people. They should assume responsibility for providing professional service to their institution, to the community of scholars in their area, and to the discipline as a whole.

- **Academic careers in teaching-intensive departments**

Those who pursue careers in teaching-intensive departments should develop an understanding of the depth and breadth of the mathematical literature. They should be able to recognize and nurture mathematical talent, to engage talented students in creative mathematical experiences, and to inspire such students to seek additional mathematical education. They should remain intellectually engaged in the discipline throughout their careers, and be aware of important developments in the research literature and the literature in mathematics education. Although the demands of their teaching duties may limit the time they have available for scholarly work, they should endeavor to remain active as scholars. They should have a general understanding of the relationship between mathematics and other disciplines. They should serve as ambassadors for the discipline as it is represented to a general audience of students, and they should provide students with a perspective on the discipline and its role in society.

- **Careers in government or the private sector**

Those who pursue careers in government or the private sector should have a broad understanding of the general mathematical literature and its relationship to other fields. They should be able to use their mathematical training to solve interdisciplinary problems and problems in other disciplines. They should serve as ambassadors for the discipline, at the interface between mathematics and other fields. They should be able to absorb essential ideas and problems from other fields and bring mathematical ideas to bear. They should be intellectually adaptable, and should be able to communicate mathematical ideas to professionals in different fields, and to communicate important ideas from other fields to the mathematical community.

Appendix B

Change Log

- 2.2 13 August 2010: Implemented changes requested by the GAC
- 2.1 18 August 2009: Updated Graduate Exam Chair, added Acting Chair information, added Full Time Certification and ABD info in the Degree chapter (with links), updated current GSAB members, added a section for future changes, assorted minor edits
- 2.0 4 July 2007: Added Summer chapter, updated vice and grad chairs and current GSAB members, updated course and exam requirements as per GAC changes, many other minor edits
- 1.2 17 Aug 2007: Added Harrassment chapter, added CAPS info, added Current GSAB members
- 1.1.1 4 Jun 2007: Changed Grad Sec's title
- 1.1 29 Nov 2006: Added Topology Qual Syllabus
- 1.0.1 23 Aug 2006: Update of Algebra Qual Syllabus
- 1.0 14 Aug 2006: Initial relase to incomming students

Appendix C

Future Changes

- 2.3 Include information on “All But Dissertation” (ABD) policies; include section on health insurance enrollment (link to policy, enrollment); update links if no longer current; include section on recitation instructor duties.