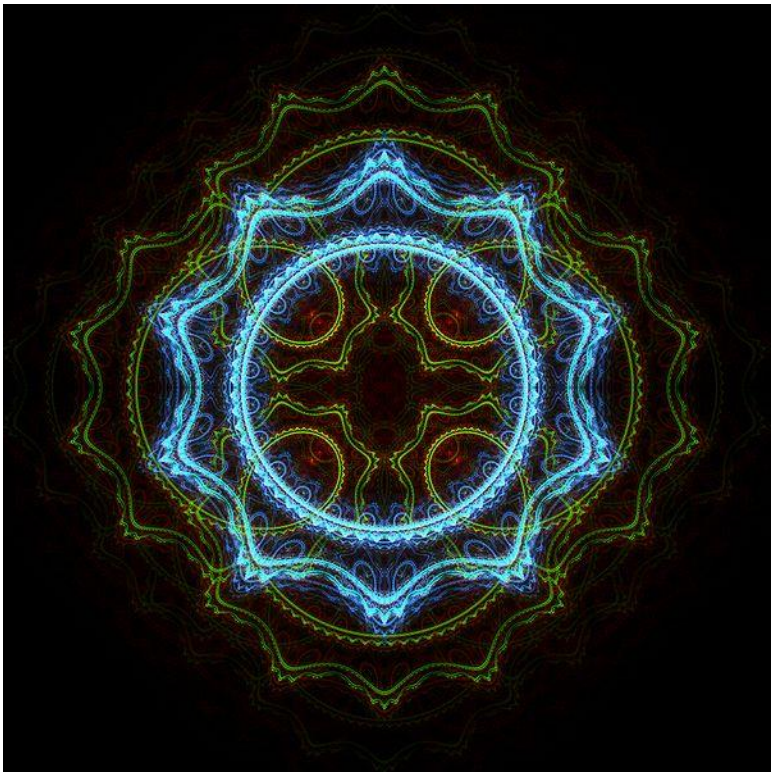
DEPARTMENT OF MATHEMATICS



Graduate Studies Handbook

Master of Arts in Mathematics:
Traditional Track
and
Teaching Option

Revised October 30, 2016.

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Welcome

Dear Student:

Welcome to the graduate program in Mathematics at California State University, Fresno. You have taken your first step towards a greater mastery of mathematics, a field that is not only a discipline, in and of itself, of breadth, depth, and beauty, but is also an indispensable tool for science, engineering, economics, business, and many more fields of study. In fact, today's mathematicians are involved in a diverse range of activities, from traditional teaching and classical mathematical research to economic forecasting, climate modeling, and genetic engineering. As a result, the employment opportunities and challenges for individuals holding an advanced degree in the mathematical sciences are varied and plentiful.

The Department of Mathematics at California State University, Fresno is committed to the highest standards of teaching, and offers courses for mathematics, science, engineering, and liberal studies majors, as well as general education mathematics courses for all majors. The Mathematics Department has 19 tenured and tenure track professors specializing in areas in pure mathematics, applied mathematics, statistics, and mathematics education.

This handbook has been prepared to help you through your journey as a graduate student, giving an overview of the master's program and describing each of the two options (the traditional track and the teaching option) and their requirements. In addition, the handbook contains various policies of the graduate program, a list of faculty and their areas of research, and a list of graduate courses.

You should meet periodically with the Graduate Coordinator to discuss your progress in the program, as well as any other issues that may arise. The Graduate Coordinator is Dr. Doreen De Leon, and she can be reached by e-mail at doreendl@csufresno.edu, by telephone at 559-279-4009, and in person in her office in the Peters Building, Room 350.

Congratulations on your entry into the graduate program, and best wishes for your success!

Doreen De Leon,
Graduate Coordinator

The Master of Arts in Mathematics – General Information

Introduction

The Department of Mathematics offers two tracks for the Master of Arts degree (M.A.): (1) the traditional M.A. or (2) the M.A. with a Teaching Option.

The traditional M.A. is ideal for individuals who are interested in working in business or industry, teaching at a community college, or earning a doctoral degree in mathematics at some later date. The M.A. with a Teaching Option is best for those who wish to assume a leadership role in high school teaching and beyond or who wish to pursue an advanced degree in mathematics education.

Admission to the Program

In order to be admitted to the program, an applicant must have earned a Bachelor's degree, preferably in Mathematics. In order to achieve classified standing (i.e., full admission), applicants should have undergraduate preparation in mathematics comparable to that of a typical mathematics major at Fresno State and have a 3.0 grade point average in the their upper division mathematics courses. Applicants lacking the above preparation may be admitted conditionally. These students will become classified after meeting additional requirements as set by the Graduate Coordinator. Coursework required to achieve classified status may not be applied towards credits for the graduate program.

All applicants are required to take the GRE Mathematics subject test. Applicants' GRE Mathematics subject test scores are expected to be at least 500.

In addition, two letters of recommendation from faculty at the applicant's undergraduate institution are required. Letters should be sent directly to the Graduate Coordinator at:

5245 North Backer Avenue, M/S PB108
Fresno, CA 93740-8001.

To be admitted to the Master of Arts program in Mathematics (either Traditional or Teaching Option), you must first apply to the University through Cal State Apply. In addition to completing the application online and sending two letters of recommendation to the Graduate Coordinator, you must also send both your

- GRE subject – official scores, and
- one official transcript for each college or university attended

to the:

Office of University Admissions – Graduate/Postbaccalaureate
5150 North Maple Ave., JA 57
Fresno, CA 93740-8026.

If you are admitted as conditionally classified, it is your responsibility to:

- meet with the Graduate Coordinator to discuss any conditions to your full admission (i.e., to achieving classified standing);
- satisfy the noted conditions; and
- have the Graduate Coordinator submit verification that you have met all of the conditions to the Division of Graduate Studies for approval as a student in classified graduate standing.

Support

The Department of Mathematics provides a variety of opportunities for students to assist them in their studies. With fewer than 25 students in the current graduate program, study tracks are facilitated with much greater ease than with larger programs. Graduate students will find that with a rich faculty-to-student ratio, faculty mentoring is individualized and tailor-made to their needs. Whether preparing for work in industry, high school and/or community college teaching, or doctoral studies, our faculty is committed to the support of our students.

Financially, students may qualify for aid after the completion of their first semester. Many of our graduate students are supported each semester by Graduate Assistant and Teaching Associate positions, which usually require 10-20 hours of work per week, with pay that ranges approximately from $5,486 to $12,128 per academic year, depending on the total assigned work hours. A limited number of partial tuition fee waivers may also be available to outstanding applicants.

Additional information regarding financial support may be found on the Graduate Studies website, http://www.csufresno.edu/gradstudies.

Faculty

Our faculty represents a wide range of theoretical orientations that include most of the major areas in mathematics. They are active in research and have a close working relationship with the National Science Foundation. Since 1992, the department has hosted three conferences supported by the NSF: two were research conferences in the mathematical sciences, and the third was an undergraduate faculty enhancement project. We have 19 outstanding professors, the majority of whom currently teach or have taught graduate courses. They include:

T. Rajee Amarasinghe, Ph.D., Indiana University, Bloomington.
Areas of research: interdisciplinary mathematics, technology in learning mathematics, ethno-mathematics.

Michael Bishop, Ph.D., University of Arizona.
Areas of research: mathematical physics, probability, functional analysis.

Lance Burger, Ph.D., Oregon State University.
Areas of research: teacher education, advanced mathematical thinking, philosophy of mathematics education.

Carmen Caprau, Ph.D., University of Iowa.
Areas of research: quantum topology, knot theory, categorifications of knot invariants.

Steve Chung, Ph.D., Florida State University, Tallahassee.
Areas of research: applied statistics, semi-parametric and nonparametric volatility models, financial time series.

Stefaan Delcroix, Ph.D., Rijksuniversiteit, Gent.
Areas of research: finite groups, abstract algebra, coding theory, number theory.

Doreen De Leon, Ph.D., UCLA.
Areas of research: numerical analysis, applied mathematics.

Comlan de Souza, Ph.D., Southern Illinois University.
Areas of research: Fourier analysis, digital signal processing, phase recovery.

Tamas Forgacs, Ph.D., University of Illinois.
Areas of research: several complex variables, differential geometry, health economics, mathematical economics.

Katherine Kelm, Ph.D., University of Oregon.
Areas of research: algebraic topology, low-dimensional homotopy, CW complexes.

Marat Markin, Ph.D., Institute of Mathematics, National Academy of Sciences of Ukraine.
Areas of research: functional analysis; operator theory; differential equations in abstract spaces; semigroups of operators.

Maria Nogin, Ph.D., University of Rochester.
Areas of research: Topological semantics of modal logics; dynamic topological systems; algebraic topology; cohomology of groups; group extensions.

Morgan Rodgers, Ph.D., University of Colorado, Denver.
Areas of research: algebraic combinatorics, computational algebra, finite geometry.

Adnan Sabuwala, Ph.D., University of Florida.
Areas of research: numerical analysis, numerical finite difference techniques, spectrally matched grids.

Jenna Tague, Ph.D., Ohio State University.
Areas of research: mathematics education.

Khang Tran, Ph.D., University of Illinois at Urbana-Champaign.
Areas of research: complex analysis; analytic number theory; zero distribution; hypergeometric and basic hypergeometric series.

Agnes Tuska, Ph.D., Ohio State University.
Areas of research: use of technology in mathematics education, concept formation, secondary mathematics teacher education.

Oscar Vega, Ph.D., University of Iowa.
Areas of research: combinatorics, finite geometries, graph theory.

Ke Wu, Ph.D., Texas Tech University.
Areas of research: applied statistics, statistical and mathematical computing.

Master of Arts in Mathematics: Traditional Track

Course Requirements

Under the direction of the Graduate Coordinator, each candidate prepares and submits for approval a coherent program of 30 units individually designed within the following framework:

(1) Required courses (9 units):
- Math 251* (Abstract Algebra);
- Math 271* (Real Analysis);
- Math 298 (Project) or Math 299 (Thesis).

(2) Elective courses (21 units):
a. At least 12 units (or 4 courses) of graduate level courses (i.e., courses in the 200 series); and
b. 9 units of approved electives (may be graduate level courses or up to 3 pre-approved upper division undergraduate math courses).

What You Should Know Before Enrolling in Math 251 and Math 271

- Math 251: Students should understand and be able to write rigorous proofs in Number Theory and Abstract Algebra. Knowledge of Linear Algebra is also required. A short list of topics that students should be familiar with follows: Z and Z_n; vector spaces; normal subgroups; group homomorphisms; S_n, A_n, D_n, Q_8, and other small-order groups; matrix groups; Lagrange's Theorem; rings; ideals; ring homomorphisms; and fields.
- Math 271: Students should understand and be able to apply topics of calculus (equivalent to Math 75, 76, and 77 at Fresno State), as well as be at ease with advanced analytical proof techniques. They should have a thorough working understanding of sequences and series and have rudimentary knowledge of basic topology, equivalent to that encountered in Math 171 and Math 172 at Fresno State.

Satisfaction of the Graduate Writing Requirement

In order to satisfy the University Graduate Writing Skills Requirement, the student must submit a formal paper demonstrating writing skill in mathematics at the graduate level. This graduate level paper may be a research proposal, a literature review in some mathematical area of interest, a paper from a directed research project, or some other paper that meets the objectives for the writing requirement as stated in the Satisfaction of the Graduate Writing Requirement section found in the Relevant Policies section of this handbook. Deadlines are given in that section.

Before attempting to satisfy the graduate writing requirement, the student must have (1) achieved classified standing, and (2) attended a Plagiarism Workshop and signed the Mathematics Department's Honor Code Statement Regarding Academic Integrity and Plagiarism. For more information on the Plagiarism Workshops, please see www.fresnostate.edu/academics/academicintegrity/workshops.

* Please note that Math 251 is only offered during the spring semester and Math 271 is only offered during the fall semester.

Advancement to Candidacy

You must advance to candidacy no later than the semester prior to graduation. It is recommended that you do this within the first 9 to 15 units of your program coursework (which should be completed by the end of the second semester).

To petition for advancement to candidacy you must have:

(1) achieved classified graduate standing;
(2) satisfied the University Graduate Writing Skills Requirement; and
(3) completed at least 9 units of your program at CSUF, maintaining a 3.0 grade point average.

Once these conditions have been met, the candidate must meet with the Mathematics Graduate Coordinator and complete the "Petition of Advancement to Candidacy" form (to be downloaded from the Division of Graduate Studies' website, http://www.fresnostate.edu/academics/gradstudies) in order to apply for advancement to candidacy. The completed form must be submitted within the first six weeks of the semester (at least one semester prior to graduation).

Graduation

The last semester prior to graduation, the candidate must do the following:

(1) (a) Enroll in Math 298. This course is the Master's Research Project that must be completed under the supervision of a faculty member. The course culminates in a written and oral report to the department; or (b) Enroll in Math 299. This course is the Master's Thesis that must be completed under the supervision of a faculty member. The course culminates in a written and oral report to the department, and a written report to the University.
(2) Within the first week, the candidate must file a request through the Division of Graduate Studies for the Master's degree to be granted by filling out and submitting a Graduate Degree Application, which can be obtained from the Division of Graduate Studies in person or on their website at http://www.fresnostate.edu/academics/gradstudies.

A set of guidelines for the Master's Project may be found in the Relevant Policies section of this handbook, and the guidelines for the Master's Thesis may be found on the Division of Graduate Studies' website at http://www.fresnostate.edu/academics/gradstudies/thesis.

Please note that a period of 5 years is allowed for the completion of all requirements for the Master's degree; that is, no coursework older than 5 years may be used to satisfy the requirements.

Master of Arts in Mathematics: Teaching Option

The M.A. with a Teaching Option program is for both working secondary mathematics teachers and holders of a bachelor's degree in mathematics who plan to teach. The core curriculum is a combination of graduate level education and mathematics courses specifically designed to enhance the content understanding and advanced level thinking skills needed for leaders in high school mathematics education.

Course Requirements

Under the direction of the Graduate Coordinator, each candidate prepares and submits for approval a coherent program of 30 units individually designed within the following framework:

(1) Required courses (15 units):
- Math 251 (Abstract Algebra)
- Math 260 (Perspectives in Geometry)
- Math 271 (Real Analysis)
- Math 298 (Project)
- CI 250** (Advanced Curriculum Theory and Analysis)

(2) Elective Courses (15 units):
   a. Math Electives (12 units). A combination of upper division (no more than 9 units) and graduate level mathematics courses (i.e., 200 level courses) to be approved by the Mathematics Department Graduate Coordinator; and
   b. Education elective (3 units). Either CI 275 (Advanced Instructional Theories and Strategies)** or an approved CI 280T.

What You Should Know Before Enrolling in Math 251, Math 260, and Math 271

- Math 251: Students should understand and be able to write rigorous proofs in Number Theory and Abstract Algebra. Knowledge of Linear Algebra is also required. A short list of topics that students should be familiar with follows: Z and Z_n; vector spaces; normal subgroups; group homomorphisms; S_n, A_n, D_n, Q_8, and other small-order groups; matrix groups; Lagrange's Theorem; rings; ideals; ring homomorphisms; and fields.
- Math 260: Knowledge of geometry at the level of CSET II. Students are expected to do constructions and proofs in classical Euclidean geometry (straightedge and compass), and also have knowledge of at least the following: coordinate geometry, conic sections, elementary non-Euclidean geometry, isometries and other transformations of the plane, 3D geometry.
- Math 271: Students should understand and be able to apply topics of calculus (equivalent to Math 75, 76, and 77 at Fresno State), as well as be at ease with advanced analytical proof techniques. They should have a thorough working understanding of sequences and series and have rudimentary knowledge of basic topology, equivalent to that encountered in Math 171 and Math 172 at Fresno State.

** CI 250 is usually offered in the fall semester, and CI 275 is usually offered in the spring semester, so you should plan your schedule accordingly.

Satisfaction of the Graduate Writing Requirement

In order to satisfy the University Graduate Writing Skills Requirement, the student must submit a formal paper demonstrating writing skill in mathematics at the graduate level. This graduate level paper may be a research proposal, a literature review in some mathematical area of interest, a paper from a directed research project, or some other paper that meets the objectives for the writing requirement as stated in the Satisfaction of the Graduate Writing Requirement section found in the Relevant Policies section of this handbook. Deadlines are given in that section.

Before attempting to satisfy the graduate writing requirement, the student must have (1) achieved classified standing, and (2) attended a Plagiarism Workshop and signed the Mathematics Department's Honor Code Statement Regarding Academic Integrity and Plagiarism. For more information on the Plagiarism Workshops, please see www.fresnostate.edu/academics/academicintegrity/workshops.

Advancement to Candidacy

You must advance to candidacy no later than the semester prior to graduation. It is recommended that you do this within the first 9 to 15 units of your program coursework (which should be completed by the end of the second semester).

To petition for advancement to candidacy you must have:

(1) achieved classified graduate standing;
(2) satisfied the University Graduate Writing Skills Requirement; and
(3) completed at least 9 units of your program at CSUF, maintaining a 3.0 grade point average.

Once these conditions have been met, the candidate must meet with the Mathematics Graduate Coordinator and complete the "Petition of Advancement to Candidacy" form (to be downloaded from the Division of Graduate Studies' website, http://www.fresnostate.edu/academics/gradstudies) in order to apply for advancement to candidacy. The completed form must be submitted within the first six weeks of the semester (at least one semester prior to graduation).

Graduation

The last semester prior to graduation, the candidate must do the following:

(1) Enroll in Math 298. This course is the Master's Research Project that must be completed under the supervision of a faculty member. The course culminates in a written and oral report to the department.
(2) Within the first week, the candidate must file a request through the Division of Graduate Studies for the Master's degree to be granted by filling out and submitting a Graduate Degree Application, which can be obtained from the Division of Graduate Studies in person or on their website at http://www.fresnostate.edu/academics/gradstudies.

A set of guidelines for the Master's Project may be found in the Relevant Policies section of this handbook.

Please note that a period of 5 years is allowed for the completion of all requirements for the Master's degree; that is, no coursework older than 5 years may be used to satisfy the requirements.

Relevant Policies

SATISFACTION OF THE GRADUATE WRITING REQUIREMENT
Department of Mathematics

The graduate writing requirement must be satisfied before the student submits a petition to advance to candidacy. A graduate student may attempt to satisfy the graduate writing requirement at any time after the student has done the following: (1) signed the Mathematics Department's Honor Code Statement Regarding Academic Integrity and Plagiarism, and (2) achieved classified graduate standing, pursuant to the submission deadlines below.

In order to meet the writing requirement, the student must submit a formal paper at least 5 pages in length demonstrating writing skill in mathematics at the graduate level. This graduate level paper may be a research proposal, a literature review in some mathematical area of interest, a paper from a directed research project, or some other math-themed paper that meets the objectives for the writing requirement, as discussed below.

The student's writing should demonstrate:

1. Clear organization and presentation of ideas;
2. Understanding of the topic discussed in the paper;
3. The ability to organize ideas logically so as to establish a sound scholarly argument based on appropriate use of mathematics;
4. Thoroughness and competence in documentation (i.e., proper use of references); and
5. The ability to express in writing a critical analysis of existing scholarly/professional literature in some mathematical area of interest.

A student must first attempt to satisfy the graduate writing requirement no later than the submission deadline during his/her second semester as a classified student.

The submission deadline for this paper is as follows:

1. If the student intends to graduate the following semester, then the paper must be submitted by e-mail to the Graduate Coordinator by the first Friday of the semester.
2. If the student does NOT intend to graduate the following semester, then the paper must be submitted by e-mail to the Graduate Coordinator no later than the Friday of the fourth week of instruction.

The paper will be distributed to a three-member review committee chosen each year by the Department Chair. The review committee will complete its review of the paper within two weeks of the submission deadline. Feedback will be sent to the student no later than one week after the review of the paper.

The paper will be scored using a rubric (1-5) in each of four areas:

I. Style and Format;
II. Mechanics;
III. Content and Organization; and
IV. Integration and Critical Analysis.

The scoring rubric appears at the end of this document. The minimal acceptable combined score from all of the four areas (I-IV) is 12 points (a mean of 3 (Satisfactory) rating on each section), with no less than a score of 2 (Developing) on any one section.

The review committee will also provide comments to the student, including justification for the scores and possible suggestions for improvement (e.g., seek tutoring, improve analysis, etc.).

Students who fail have two options:

1. Resubmit an edited paper by the Friday of the tenth week of instruction of the same semester to the original review committee; or
2. Appeal – a new committee will be selected to review the student's submission.

Students who fail to complete the writing requirement after availing themselves of one of the two options above must take the course ENGL 160W (Writing Workshop) or an alternative acceptable to the Graduate Coordinator. In the semester immediately after taking this course, the student must submit a new document for evaluation to the current review committee no later than the submission deadline (first Friday of the semester if graduating that term, otherwise Friday of the fourth week). The new document cannot be a revision of the original submission. The main focus, or essence, of the paper must be significantly different from the original paper and its revision. Students who fail the writing requirement three times will be dismissed from the mathematics graduate program. Failure to submit a paper by this deadline will be construed as failing the writing requirement, and the student will be dismissed from the mathematics graduate program.

Plagiarism in the completion of this, or any other written work, is unacceptable, and may lead to suspension or dismissal from the University.

Scoring Rubric Used to Evaluate Student Submissions to Satisfy the Graduate Writing Requirement.

I. Style and Format

5 – Exemplary: In addition to meeting the requirements for a "4," the paper consistently models the language and conventions used in scholarly writing in the student's area of study. In other words, the manuscript's style and format are at the level required for a publication in a peer-reviewed journal.

4 – Accomplished: While there may be minor errors, standard conventions for style and format are used consistently throughout the paper. The paper has an abstract, an introduction to the topic, and a conclusion. The paper demonstrates thoroughness and competence in documenting sources; the reader would have little difficulty referring back to cited sources. Style and format help make the paper understandable to the reader.

3 – Satisfactory: A standard style and format is broadly followed, but inconsistencies and/or other errors are apparent. There may be references to less suitable mathematics sources (non-peer reviewed literature, web information). Weak transitions and apparent logic gaps may occur between topics being addressed. The style may be difficult to follow so as to detract from the comprehensibility of the paper.

2 – Developing: While some mathematics conventions are followed, others are not. The paper lacks consistency of style and/or format. It may be unclear which references are direct quotes and which are paraphrased. Based on the information provided, the reader would have some difficulty referring back to cited sources. Significant revisions would contribute to the comprehensibility of the paper.

1 – Beginning: The stylistic conventions of mathematics writing are not followed. The paper fails to demonstrate thoroughness and competence in documentation. Inappropriate style and format make reading and comprehensibility problematic.

II. Mechanics

5 – Exemplary: In addition to meeting the requirements for a "4," the paper is essentially error-free in terms of mechanics. Writing flows smoothly from one idea to another. Transitions effectively establish a sound scholarly argument and aid the reader in following the writer's logic.

4 – Accomplished: While there may be minor errors, the paper follows normal conventions of spelling and grammar throughout. Errors do not significantly interfere with topic comprehensibility. Transitions and organizational structures such as headings and subheadings are effectively used to help the reader move from one point to another.

3 – Satisfactory: Grammatical conventions are generally used, but inconsistency and/or errors in their use result in weak, but still apparent, connections between topics in the formulation of the argument. There is poor or improper use of headings and related features to keep the reader on track within the topic. Effective mathematics vocabulary is used.

2 – Developing: Frequent errors in spelling, grammar (such as subject/verb agreements and tense), sentence structure, and/or other writing conventions make reading difficult and interfere with comprehensibility. There is some confusion in the proper use of mathematical terms. Writing does not flow smoothly from point to point; appropriate transitions are lacking.

1 – Beginning: The paper contains numerous errors in spelling, grammar, and/or sentence structure, which make following the logic of the paper extremely difficult. Mathematical terms are frequently misused.

III. Content and Organization

5 – Exemplary: In addition to meeting the requirements for a "4," the paper excels in the organization and representation of ideas related to its mathematical topic. The paper illustrates mastery of the topic and conveys to the reader the student's understanding of the material.

4 – Accomplished: The paper follows all requirements. The mathematical topic is carefully focused, and the paper clearly outlines and discusses the major points related to the topic. Ideas are logically arranged to present a sound scholarly argument. The paper is interesting and holds the reader's attention. The paper does a credible job summarizing related literature. General ideas are expanded upon in a logical manner. The work clearly goes beyond simply restating known ideas.

3 – Satisfactory: The paper summarizes known concepts but has little expansion beyond restatement of known ideas. Certain logical connections or specific topics related to the paper's subject area may be omitted. Ideas and concepts are generally satisfactorily presented, although lapses in logic and organization are apparent. The paper suitably introduces the reader to the topic being presented.

2 – Developing: The paper is logically and thematically coherent, but is lacking in substantial ways. The mathematical content may be poorly focused or somewhat lacking, or the scholarly argument may be weak or poorly conceived. Major ideas related to the content may be ignored or inadequately explored. Overall, the content and organization needs significant revision to represent a critical analysis of the topic.

1 – Beginning: Analysis of existing scholarly/professional literature on the topic is inadequate. The mathematical content is poorly focused or lacking and the paper lacks organization. The reader is left with little information about, or understanding of, the paper's topic.

IV. Integration and Critical Analysis

5 – Exemplary: The document presents a well-organized and fully-developed logical presentation, including clear analysis and synthesis of information from the various references. The paper evidences substantial, logical, and concrete development of ideas. References come from appropriate peer-reviewed journals or books. The paper illustrates a complete grasp of the proof methodology presented in the papers or books. The essential findings of multiple sources are accurately and concisely paraphrased, analyzed, and integrated. Original sources are clearly identified and correctly cited in both the body of the text and the reference section. Organizationally, smooth and effective transitions between topics lead the reader through an orderly discussion of the topic being addressed. If a research proposal is being presented, then the document presents the current state of knowledge for the topic being addressed using a variety of references. In addition, the gaps in current knowledge are clearly identified and significant directions and approaches that fill these gaps are identified.

4 – Accomplished: There are inconsistencies in the organization and/or logic of the presentation, but still a clear analysis of the presented materials. While synthesis of all aspects of the topic may show varying degrees of development, the overall consistency, thoroughness, and analysis result in a well-crafted document.

3 – Satisfactory: Identification of key topics or uncertainties in the paper's area may be incomplete. Although the paper synthesizes ideas from references, analysis of the information may be poorly developed or lacking. Complex topics and related concepts are awkwardly presented and linkages among topics may be unclear.

2 – Developing: Weakness is evident in the coverage of the paper' area and analysis of information from the references, resulting in incorrect or poorly developed synthesis of results. Analysis is limited to summarizing mathematical topics. The result is a degradation of the paper, and the evidence of knowledge gaps.

1 – Beginning: The paper contains numerous flaws in the essential components of a literature review. The paper lacks a successful synthesis of disparate works, and there is no logical flow to the presentation. These issues result in a paper with limited comprehensibility and utility in illustrating the author's effective grasp of the material.

POLICY ON ACADEMIC PROBATION AND DISQUALIFICATION
Department of Mathematics

According to University policy, a graduate student is immediately disqualified from the University and program when his/her grade point average (GPA) falls below 2.0 in any semester. A student whose GPA falls below 3.0, but is above 2.0, is placed on academic probation. A student who is placed on academic probation for any two semesters (not necessarily consecutive) will be disqualified from the University and program. A disqualified student who wishes to re-enroll in the university and program MUST file a Petition for Readmission with the Mathematics Department.

The relevant GPA to determine standing is the cumulative GPA for graduate students who have not been advanced to candidacy. The program GPA determines the standing of graduate students who have been advanced to candidacy with an approved program on file.

Upon notification of disqualification, the student must make an appointment to meet with the Graduate Coordinator to discuss his/her situation and determine if any extenuating circumstances exist that mitigate the disqualification. If disqualification applies, the student must prepare and file the Petition for Readmission packet, as outlined below, with the Graduate Coordinator.

If disqualification applies, students should file their petition as soon as they receive notification of disqualified status if they want to request to be readmitted in the next semester.

The petition packet must include:

- the Petition for Readmission (form found on the Division of Graduate Studies website);
- a 1-page typed letter of appeal explaining the circumstances that affected the GPA;
- supporting documentation of any extenuating circumstances; and
- strong letters of support from at least 2 graduate program instructors who know the student's work (in sealed envelopes).

The Graduate Coordinator will distribute the petition materials to members of the Department Graduate Committee. Petitions that are filed by the first day of the fall or spring semester will be reviewed at a special meeting of the Graduate Committee scheduled for this purpose during the first week of classes to make it feasible for a student to be reinstated if the petition is approved. If there has been no break in enrollment, no application to the university is required. Petitions submitted after the first day of the semester will be reviewed at least two weeks before the application deadline for the following semester.

The Department Graduate Committee is responsible for making the recommendation on whether a student will be approved or denied for readmission. The Graduate Coordinator will send a decision letter to the student; if readmission is approved, any conditions are specified in this letter. The original petition, signed by the Graduate Coordinator, is submitted to the University Registrar's office with copies to Graduate Admissions and Division of Graduate Studies. A copy of the decision letter, specifying any conditions, is also sent to the Division of Graduate Studies.

The Graduate Coordinator will monitor disqualified readmitted students to ensure that they meet the conditions that they are expected to meet. In addition to specific conditions set by the program in its decision letter, a readmitted disqualified student must meet the University Graduate Committee requirement of earning a term GPA of at least 3.5 in each subsequent term until he/she attains a cumulative GPA of 3.0 (good standing) to avoid disqualification in the following semester(s). (The University Graduate Committee suggests that readmitted

disqualified students generally not take new 200-level courses; they may, however, repeat 200-level courses that they did not pass. Note that graduate students are not eligible for grade substitutions. In addition, no more than 9 units a semester should be attempted. However, the plan/conditions are determined by the Department Graduate Committee.)

A graduate student may appeal the decision of the Department Graduate Committee (e.g., denial of the Petition for Readmission or the conditions of readmission) in writing to the Chair of the Department of Mathematics. This letter should be included in a packet containing the documents provided in the Petition for Readmission. If necessary, further appeals may be made to higher administrative levels in the following sequence after review at each level: Dean of the College of Science and Mathematics, Dean of Graduate Studies, Provost of the University.

Note: Per University policy, disqualified graduate students who choose not to petition for readmission, leave the university, and at some later point, re-apply to Fresno State, will be denied admission based on the disqualification. Such a student must file a Petition for Readmission and should not pursue the "Special Admission" process.

GUIDELINES FOR MASTER'S PROJECT IN MATHEMATICS

The master's research project in mathematics should represent independent investigation of a topic of an advanced nature, including a written project report and an oral presentation.

For the Traditional Track, the master's project should represent independent investigation of a topic in advanced mathematics that is not covered in a standard course. For the Teaching Option, the project should represent independent investigation into either mathematics education or a topic in advanced mathematics that is not covered in a standard course.

Before beginning work on a master's project, the student must form a project committee, in consultation with the Graduate Coordinator and the Project Advisor, consisting of the Project Advisor and two additional faculty members, at least one of whom must be a mathematics department faculty member. The Graduate Coordinator must approve of this committee, and be informed in writing of the nature of the project, before the student enrolls in Math 298.

The Project committee must be kept apprised of the student's progress on the project, including:

1. Being given a description of the nature of the project within the first two weeks of the commencement of the project.
2. Being updated at least (a) at the middle of the semester, and (b) three-quarters of the way through the semester, regarding the student's progress on the project. These updates may be accomplished by providing the committee with a current draft of the written project report or an oral report or presentation.
3. Being given a final draft of the written report (unbound) for review at least one week before the oral presentation.

If the majority of the Project committee members does not approve the project after reviewing the final report due to significant deficiencies, then the student will not be permitted to present his/her project and, thus, will not be able to graduate in the current semester. The committee will provide the student with a list of the deficiencies of his/her project which must be corrected to make the student's project acceptable, and, once these revisions are made, the project will be re-evaluated.

The written report should follow these guidelines:

- The final version (unbound) of the written report must be submitted to the Project committee and the Graduate Coordinator for review at least one week before the oral presentation.
- Three bound copies of the report must be prepared and submitted to the Graduate Coordinator at the time of the oral presentation.
- The bound copies of the written report must contain a signature page that is signed by all three members of the Project committee.
- The format of the title page of the project report and the signature page must be obtained from the Graduate Coordinator.
- The report should be self-contained and understandable to anyone with an advanced mathematical background.
- The report must represent your own, independent work. Plagiarism will not be tolerated.
- The written report must be typeset and double-spaced.
- A well-written report will contain
    - a title page,
    - the signature page;

- an abstract;
- a table of contents,
- an introduction,
- a main body,
- a conclusion, and
- a bibliography.

The oral presentation must:

- be approximately a 45 minute presentation that clearly summarizes the project or research done, followed by a question and answer session; and
- demonstrate a thorough understanding of the researched topic.

Graduate Courses

Mathematics Courses

MATH 202. Fundamental Concepts of Mathematics (3)
Prerequisites: MATH 151, 161 and 171. Fundamental notions regarding number theory, number systems, algebra of number fields; functions.

MATH 216T. Topics in Number Theory (3; max total 6)
Prerequisite: MATH 116. An investigation of topics having either historical or current research interest in the field of number theory.

MATH 220. Coding Theory (3)
Prerequisites: MATH 151 and MATH 152. Basic concepts in coding theory, properties of linear and non-linear codes, standard decoding algorithms, cyclic codes, BCH-codes.

MATH 223. Applied Operator Theory (3)
Prerequisite: graduate standing or permission of instructor. Fundamentals of abstract spaces and spectral theory of operators with applications. Resolvent set and spectrum of a linear operator. Bounded and unbounded linear operators. Compact operators and the Fredholm alternative. Symmetry and self-adjointness.

MATH 228. Functions of a Complex Variable (3)
Prerequisite: MATH 128. Representation theorems of Weierstrass and Mittag-Leffler, normal families, conformal mapping and Riemann mapping theorem, analytic continuation, Dirichlet problem.

MATH 232. Mathematical Models with Technology (3)
Prerequisite: graduate standing in mathematics or permission of instructor. A technology-assisted study of the mathematics used to model phenomena in statistics, natural science, and engineering.

MATH 250. Perspectives in Algebra (3)
Prerequisite: graduate standing in mathematics or permission of instructor. Study of advanced topics in algebra, providing a higher perspective to concepts in the high school curriculum. Topics selected from, but not limited to, groups, rings, fields, and vector spaces.

MATH 251. Abstract Algebra I (3)
Prerequisite: undergraduate abstract algebra. Groups, rings, integral domains, and fields.

MATH 252. Abstract Algebra II (3)
Prerequisite: MATH 251. Rings and ideals, modules, linear and multilinear algebras, representations.

MATH 260. Perspectives in Geometry (3)
Prerequisite: graduate standing in mathematics or permission of instructor. Geometry from a transformations point of view. Euclidean and noneuclidean geometries in two and three dimensions. Problem solving and proofs using transformations. Topics chosen to be relevant to geometrical concepts in the high school curriculum.

MATH 263. Point Set Topology (3)

Prerequisite: MATH 172. Basic concepts of point set topology, set theory, topological spaces, continuous functions; connectivity, compactness and separation properties of spaces. Topics selected from function spaces, metrization, dimension theory.

MATH 270. Perspectives in Analysis (3)

Prerequisite: graduate standing in mathematics or permission of instructor. An overview of the development of mathematical analysis, both real and complex. Emphasizes interrelation of the various areas of study , the use of technology, and relevance to the high school mathematics curriculum.

MATH 271. Real Analysis (3)

Prerequisite: MATH 172. Lebesgue's measure and integration theory on the real line. Limit theorems and types of convergence. L^p spaces. Differentiation and integration.

MATH 290. Independent Study (1-3; max total 6)

See Academic Placement -- Independent Study. Approved for RP grading.

MATH 291T. Seminar (1-3; max total 6)

Prerequisite: graduate standing. Seminar covering special topics in an area of mathematical research. (Formerly MATH 291)

MATH 298. Research Project in Mathematics (3)

Prerequisite: graduate standing. Independent investigation of advanced character as the culminating requirement for the master's degree. Approved for RP grading. Requirements for project.

MATH 299. Thesis in Mathematics (3)

Prerequisite: See Criteria for Thesis and Project. Preparation, completion, and submission of an acceptable thesis for the master's degree. Approved for RP grading.

Curriculum and Instruction Courses

CI 250. Advanced Curriculum Theory and Analysis (3)

Theory and practice of curriculum development, evaluation, and revision. Study of contemporary problems and curriculum approaches to meet societal needs. (2 lecture, 2 lab hours)

CI 275. Advanced Instructional Theories and Strategies (3)

Study and application of contemporary research and theory in teaching and instruction.