**Graduate Learning Outcomes and Assessment Plan**
**Department of Mathematics**

While the Department of Mathematics awards both master's degrees and Ph.D. degrees, all incoming students are admitted to the Ph.D. program. For this reason, this document will focus on learning outcomes for Ph.D. students. A note on master's degrees will be included at the end.

**Learning Outcome #1: Demonstrate mastery of subject knowledge in three core areas.**

**Explanation:** The three core subject areas taught in our department are algebra, topology/geometry, and analysis/probability. Graduate students are expected to attain a mastery of this material at an advanced level for two of the three core areas, and at an intermediate level for the third area.

**Assessment:** Each student is required to complete full-year course sequences in each of these three areas, at least two of which are taken at the 600-level, with an average grade of B+ or better and a minimum grade of B or better in each sequence. These sequences must be completed by the end of the student's second year. In addition, each student is required to pass a qualifying exam in two of these three areas by the end of the student's third year. A student who takes and passes one of the qualifying exams during their first year is exempted from the corresponding sequence requirement.

**Learning Outcome #2: Demonstrate ability to learn from non-expository sources.**

**Explanation:** Learning material from research papers is different from learning from courses and textbooks. Graduate students are expected to demonstrate the ability to learn material from non-expository sources, including at least one source that is written in French, German, or Russian.

**Assessment:** Each student will take a two-hour oral exam, administered by three professors in the Math Department. The student will design the syllabus for the exam, which is required to include non-expository material and to not be narrowly limited to one or two special topics. This syllabus must be approved in advance by the examiners and by the Ph.D. subcommittee of the Graduate Affairs Committee. Before the oral exam takes place, the student must demonstrate to one professor (typically their prospective advisor) the ability to read and discuss all or part of a paper in French, German, or Russian. A student is expected to take their oral exam in the year after completing the second of the two qualifying exams.

**Learning Outcome #3: Conduct original and substantive research.**

**Explanation:** The most important requirement completing a Ph.D. in mathematics is producing a dissertation containing original and substantive mathematical work.

**Assessment:** The dissertation is submitted in writing to the student's dissertation committee and synthesized in a one-hour presentation during the oral defense. Each student is expected to defend their dissertation by the end of the sixth year in the program. Each student who has completed the oral exam will meet with the internal members of their dissertation committee at least once during the spring term of each academic year to ensure that the student is making adequate progress. Typically the oral exam is passed in Year 4 and the Dissertation is submitted in Year 6, so only one such meeting is required (in the spring of Year 5). However, a student who completes oral exams early and/or successfully petitions for extra time to complete the dissertation may have multiple dissertation committee meetings.

**Master's degrees.** The learning outcomes and assessments for students who earn a master's degree consist of a modified version of Learning Outcome #1 for Ph.D. students. To earn a master's degree, a student must complete full-year course sequences in each of the three core areas, one at the 600-level and two at the 500-level, with an average grade of B+ or better and a minimum grade of B or better in each sequence. In addition, the student is required to complete at least 45 graduate credit hours, at least 30 of which are completed in the Department of Mathematics.