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July 7, 2005

To: David Thorud  
Acting Provost

From: Gail L. Dubrow  
Associate Dean for Academic Programs

Re: Department of Mathematics Program Review

*Summary and Recommended Action*

At its meeting of April 7, 2005, the Graduate School Council met with two members of the team reviewing the Department of Mathematics; with the Chair and two representatives of the Department; and with the Dean and Divisional Dean of the College of Arts and Sciences. The Council recommended that the Department continue on a 10-year review cycle, with the next review in the 2013-2014 academic year. The Department has made significant progress since the last review, improving both the student experience and its own service to the University, while it has recruited excellent new faculty and maintained strong K-12 outreach activities. The Council commended the Department for its progress and encouraged continued efforts to build on its strengths. It recommended a small investment by the University in the Mathematics Study Center which would greatly increase the support of students. The Council also noted that students would be well served by improved coordination in scheduling Mathematics sections in classrooms that are suited for its courses. In addition, the Council recommended that the Department and University work to better support outreach efforts by more formally recognizing faculty engagement in these programs. The Council also urged the Department to further improve the undergraduate major experience by implementing a capstone experience, as well as through faculty involvement in advising. A more proactive, ongoing assessment of its programs would allow the Department to better continue the positive development it has demonstrated.

I concur with the Council's recommendations and comments.

*Background*

The Department of Mathematics offers BA, BS, MA, MS, and PhD degrees. In addition, it participates in the undergraduate ACMS program (Applied and Computational Mathematical Sciences) with Applied Mathematics, Computer Science and Engineering, and Statistics. The Department of Mathematics currently has 54 full-time faculty, over 80 graduate students, and

about 450 undergraduate majors in the Mathematics and ACMS degree programs. The Department also provides a key service to the broader University community through its undergraduate courses, resulting in over 15,000 student enrollments per year. These courses include pre-calculus and calculus courses, intermediate-level mathematics courses required of science and engineering students, and courses for undergraduate mathematics majors. Since the previous program review, the Department has undertaken a major reform of its calculus offerings, both in its traditional sequence and in those courses designed specifically for business and life sciences majors. Class size has been reduced, student satisfaction and demand have increased, and the number of Mathematics majors has grown significantly.

### *Review Process*

The review committee included five members, three internal and two external members from peer institutions. The committee was chaired by Werner Stuetzle, Professor in the Department of Statistics, and included as the other internal members Paul Beame, Professor in the Department of Computer Science and Engineering, and Ann Nelson, Professor in the Department of Physics. The external members of the committee were Michael Artin, Professor in the Department of Mathematics at the Massachusetts Institute of Technology, and B. Alan Taylor, Professor in the Department of Mathematics at the University of Michigan. The committee carried out the review during Spring and Autumn Quarters 2004, which included a review of the self-study, followed by about 20 preliminary meetings by committee members Beame, Nelson, and Stuetzle with administrators, department leadership, faculty, staff, graduate students, and undergraduates. A two-day site visit occurred on November 8-9, 2004, when the complete committee met with members of the Department as well as with representatives of other departments that interact on a regular basis with Mathematics.

### *Review Findings*

The review team found the Department to be an outstanding research unit whose faculty have received numerous honors for their work. Department faculty collaborate with many other units throughout the University. The review committee found that the Department has shown good judgment in hiring and that junior faculty are especially strong. The unit currently stands in the middle of its national cohort, but the reviewers feel that given recent trends in the Department it is well positioned to improve its standing in the future. Department governance functions well, and the atmosphere appears harmonious. The reviewers strongly praised the very successful K-12 outreach program that serves the community and the State of Washington well. This is, however, a somewhat fragile program that relies on the work and contacts of few faculty. The reviewers recommended broader engagement by faculty interested in outreach, supported by the corresponding recognition of such activity by the Department and University in merit and promotion considerations.

The Department has made dramatic improvements in its academic programs since its last Graduate School review. The most significant area of change has been the very successful calculus reform in the lower-division pre-calculus and calculus courses. Student satisfaction has increased and class size has been dramatically reduced, in part due to increased faculty engagement and a willingness to increase teaching loads across the board. The Mathematics Study Center was created to offer students in introductory courses support through peer learning and tutoring by undergraduates, graduate students, and faculty. The Center has been so successful that the Department has had to restrict the number of courses it serves. The Review Committee recommended a small investment of university resources, space, and tutoring support in the Study Center that would allow the Department to effectively extend its support services to

many more undergraduates. The Department has been very effective at gauging and accommodating the needs of students from across the University who take its courses, as well as in engaging in ongoing evaluation of possible curriculum improvement. This is critical, since Mathematics provides a central service to the University as a gateway discipline for all science and engineering students. The very successful ACMS program stands in need of more stable funding to continue its mission.

The reviewers recommended that the Department work to increase the sense of community and connection among majors, especially for those in the standard BS and BA programs. This might include creating a forum for student-to-student interaction, such as course-based chat groups or web sites, organizing informal gatherings for majors, or assisting in the creation of a student math club. Other, more programmatic ways of creating community would include implementing capstone courses and assigning faculty advisors to undergraduate majors.

The graduate program has also improved significantly in the past five years in both size and quality. Students appeared collegial and well satisfied. Recruiting and student mentoring have improved, and the Department has been able to better support its students through various sources of funding. In light of the success of the undergraduate ACMS degree, the reviewers recommended consideration of a professional masters degree, offered jointly with Applied Mathematics and Statistics.

### *Council Recommendations*

The Council commends the Department's development since the 1992 review and especially over the past 5 years. The positive outcomes in curricular reform and faculty hiring, as well as continued progress in increasing endowment funds to support faculty and students, speak to the positive trajectory of the Department. The well-being of this Department affects many students and programs throughout the University community, so it is essential that this program continue its positive development. To aid this, the Council urges the College to make permanent its temporary investments in the calculus reform effort. Also, improved coordination between the classroom scheduling office and Mathematics would allow the Department to better serve its students with classrooms that have the appropriate set-up. The Mathematics Study Center has been a very successful model for student support outside the classroom, and a moderate investment in space and resources by the University would allow the Department to offer these services more widely. The Council agrees with the review committee recommendation that a merger between Mathematics and Applied Mathematics should not be pursued at this time, since the negative impacts would most likely outweigh any potential benefits.

The Council urges the Department to engage in more proactive and routine assessment of the student experience. This includes both an increase in the number of courses evaluated by students, as well as the implementation of a final student assessment, such as an exit interview. The Department should use this to evaluate, among other things, what University-wide factors have contributed to increased major enrollment. Better data will aid the Department as it works to improve the student experience on an ongoing basis. The Council also encourages the Department to pursue programmatic improvement in the undergraduate major by creating a capstone experience and by involving faculty in undergraduate advising.

cc: Mark A. Emmert, President  
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