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Purpose of the Doctorate in Mathematics (February 15, 2006)

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 graduate's immediate community, and within the broader community of mathematical scholars;
- the ability to communicate the beauty and power of mathematical ideas to diverse audiences; and
- 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.