Name of Program: B.S. in Mathematics, B.A. in Mathematics, B.S. in Statistics[1]

Name and contact information for person completing the review: Jim Vance, Assistant Chair of Department, jvance@math.wright.edu, x2206

Indicate whether the program is
XXXX on campus
_____ online
_____ both

NCA Criterion 1—Mission and Integrity
NCA Criterion 2—Preparing for the Future
NCA Criterion 3—Student Learning and Effective Teaching
NCA Criterion 4—Acquisition, Discovery, and Application of Knowledge
NCA Criterion 5—Engagement and Service

I. Program Mission **(NCA Criterion 1 and Criterion 5)**

- program mission statement (should identify constituency served) **(1A, 1B)**

The Department of Mathematics and Statistics endeavors i) to provide quality programs and courses, at the undergraduate and graduate levels, for students pursuing studies in the mathematical sciences, ii) to promote excellence in research and scholarship, and iii) to respond to the needs of the University and the community in the areas of mathematics and statistics. (excerpted from the Department's 1996 *Program Review and Self-Study*)

- consistency with university mission **(1C, 1E)** and consistency with college mission **(1C, 1E)**

Wright State University Mission Statement

Wright State University will be a catalyst for educational excellence in the Miami Valley, meeting the need for an educated citizenry dedicated to lifelong learning and service. To those ends, as a metropolitan university, Wright State will provide: access to scholarship and learning; economic and technological development; leadership in health, education, and human services; cultural enhancement, and international understanding while fostering collegial involvement and responsibility for continuous improvement of education and research.

College of Science and Mathematics Mission (from CoSM Strategic Plan, September, 2007)

To create passion for Science and Mathematics through evidence-based discovery, advancing knowledge of the natural world

[1] "Mathematics Education (B.S.)" is one of the programs slated for review during 2007-2008 at http://wright.edu/ucapc/uaprc/uaprc.htm ; however there is no program by that name at Wright State University. For that reason "Mathematics Education (B.S.)" is not listed as one of the reviewed programs. The Department does offer several tracks, or concentrations as they are called, for obtaining a B.S. in Mathematics, one of them being the Mathematics Education Concentration. The recently approved B.S. in Statistics is essentially identical to what was formerly called the B.S. in Mathematics, Statistics Concentration. For that reason we list the B.S. in Statistics as one of the reviewed programs.

The mission of the Department of Mathematics and Statistics (hereafter, the Department) is of course consistent with the University and College missions cited above. Indeed, the mathematical sciences are among a very small number of core disciplines without which few if any of the University and College mission objectives can be achieved. A century ago, must not educated citizens have possessed basic quantitative literacy? Today, the standard of that literacy is considerably higher, and the need for it much greater, than ever before. Likewise, today one sees the infusion of quantitative methods into more segments of the economy and into more occupations than ever before. Moreover, cutting-edge mathematics and statistics touches more lives today than ever before; to illustrate, consider the mathematically intensive medical imaging techniques that save lives daily, or the mathematical encryption of credit card data transferred over the Internet when one makes an online purchase, or the statistician's role in taking polls and in testing new medicines.

- consistency of goals, learning objectives with program mission **(1C)**

Program Goals from the Department's *Assessment Plan for Undergraduate Programs* as revised October 22, 2004 (hereafter, the *Assessment Plan*):

1. Employment in which the undergraduate major was relevant to obtaining the position or performing in it (or both)
2. Entrance into a graduate or professional program dependent upon the undergraduate major.

Learning Outcomes from the *Assessment Plan*:

1. Advanced ability to reason logically
2. Ability to communicate effectively the mathematics they have learned, in both written and oral form
3. Ability to read junior/senior level mathematical and/or statistical texts and papers
4. Understanding of the principles governing the mathematics and/or statistics they have encountered

Among the three items in the program mission statement quoted above, item (i) is the one that pertains directly to the Department's mission in teaching our undergraduate majors: "The Department of Mathematics and Statistics endeavors to provide quality programs and courses, at the undergraduate and graduate levels, for students pursuing studies in the mathematical sciences". The Department faculty have selected learning outcomes 1-4 quoted immediately above as tangible consequences that should occur if we achieve mission item (i), and those learning outcomes should, in turn, result in the realization of program goals 1-2 above. Hence these goals and learning objectives (outcomes) are indeed highly consistent with the Department's program mission.

- extent to which program prepares students to "live and work in a global, diverse, and technological society" **(4C)**

Few if any academic disciplines pervade our 21st century global society to the extent that the mathematical sciences do. Indeed, the language of mathematics is common to the physical sciences, computer science, and engineering (as has been the case for decades or in some instances even centuries) and is propagating to many other disciplines, among them economics, business, and medicine. Thus, students who complete a degree in the mathematical

sciences are well positioned to participate constructively in an incredible spectrum of occupations and segments of the economy.

- extent to which program, through its curriculum and co-curriculum, fosters civic engagement and social responsibility **(5A, 5C)**

The Department's program fosters civic engagement and social responsibility primarily through the university-wide general education requirements.

- extent to which program fosters life-long learning **(4A)**

This objective, too, is addressed via general education. Moreover, the broad applicability of the mathematical sciences, and more importantly the deductive reasoning skills that underlie the mathematical sciences, constitute powerful preparation for a lifetime of independent learning.

- interrelationship with general education **(1C, 4B)**

All the programs reviewed in this document replace the standard general education mathematics requirement, MTH145, with more advanced courses (which are of course officially approved substitutes for MTH145).

- interrelationship with other WSU programs **(1C)**

A significant number of undergraduate programs offered by other departments in the College of Science and Mathematics (CoSM) and even by departments outside CoSM overlap substantially with the programs reviewed in this document. This is so simply because beginning college mathematics (calculus and the like) is not only the conventional starting point in mathematics for mathematics and statistics majors, but also essential for students in the sciences, engineering, and the like. Thus one finds, for example, that majors in *all* the following disciplines require at least MTH229, 230, and 231 (Calculus I, II, and III – the beginning mathematics courses for all the programs reviewed in this document): chemistry, physics, biomedical engineering, computer engineering, computer science, electrical engineering, engineering physics, industrial and systems engineering, mechanical engineering, and finally materials science and engineering.

- community engagement **(5C, 5D)**

The staff and faculty of the Department are of course involved in many extra-WSU activities that build community and help people – just as could be said, we are sure, of similarly-sized units throughout the university. Of greater interest for this report, however, are the several instances in which the faculty are engaged in a way directly related to their professional lives. Thus one finds Departmental faculty serving as science fair judges, providing free mathematics tutoring for school children and teenagers, representing both our Department and its disciplines at Dayton's annual TechFest, and supporting academic clubs at area schools.

More, the Department's mathematics educators have a substantial impact in improving the public schools state-wide and even nationally, an objective of fundamental societal significance. In addition to their core responsibilities of teaching mathematics to pre-service teachers, engaging in original scholarship, and developing curricula aligned with changing criteria for teacher licensure, our educators are engaged in a remarkable variety of outreach activities,

many targeted for “in-service” teachers. For example, consider the West Region EXCEL Center, one of several collaborative ventures in which our educators participate. Originally part of the EXCEL Center of Excellence consisting of the Center Region (Ohio State University, Columbus City Schools) and the West Region (WSU, the University of Dayton, Sinclair Community College, Edison State Community College, Central State University, Dayton Public Schools, and Springfield City Schools) with Ohio State acting as the fiscal agent, funding began in December, 2002 and continues to the present. Due to different contexts, activities, and collaboration levels, the West Region EXCEL Center became an independent state regional Center of Excellence just this past June. The Ohio Board of Regents views the EXCEL centers as playing significant coordinating roles in science and mathematics education initiatives in teacher preparation and K-12 student achievement improvement. With the current emphasis on teacher preparation and on student achievement improvement in mathematics and science and the increased collaboration between state educational agencies, the state is beginning to consider the Centers as “infrastructure” in state level initiatives. Key to this role are the regional partnerships among higher education, K-12, and other regional educational entities that enable coordination of human and fiscal resources to address issues in science and mathematics education.

Let us provide a few additional examples of ways in which our mathematics educators reach out to the community:

- Locally, at the Charity Adams Earley Academy for Girls, Dayton Public Schools (presently grades K-4), our educators meet monthly with mathematics teachers to facilitate their professional development. Likewise, one has aided the Oakwood City Schools with a recent Curriculum Alignment Study.
- At the state policy level, our educators have served on the Ohio Educator Standards Board (representing Arts and Sciences faculty at Ohio's institutions of higher education; this board will, for example, consider major revisions in Ohio’s teacher licensure requirements), the Ohio Science and Mathematics Education Policy Advisory Council, the Ohio Graduation Test Mathematics Standard Setting Panel, and the Governor’s Commission on Teaching Success.

II. Program Description **(NCA Criterion 2)**

- brief history of program, emphasizing past seven years (e.g., changes in administration, change in program direction, new degrees, minors, or certificates, de- or re-activation of program), including recommendations of any previous internal and/or external program reviews

About the program: The mathematics major is available at essentially every institution in the nation offering undergraduate degrees and has in particular been available for decades here at Wright State. The Department has long offered the B.A. in Mathematics; and likewise has offered tracks leading to the B.S. in Mathematics with concentrations in Pure Mathematics, Applied Mathematics, Computing, and Statistics. Minors in Mathematics and in Statistics have likewise long been available. More recently, the Department added a new B.S. track – our concentration in Mathematics Education, for prospective high school mathematics teachers – a track that is consistent with (1) our Department having embraced the obligation of academic units throughout CoSM to play an expanded role in educating “pre-service” (prospective) school teachers and (2) changed licensure rules for high school teachers, which briefly stated require an undergraduate degree not in education but instead in the academic discipline to be taught. Most recently, the B.S. in Mathematics, Statistics Concentration, has been transformed into the B.S. in Statistics. Although the program itself is essentially unchanged, the new title brings appropriate visibility to the discipline of statistics, as it has matured as an independent scholarly

field and grown dynamically in its application to society. Finally, underlying these curriculum-level developments one finds the expected introduction of new courses and refinements to existing ones.

About leadership: During the past seven years, the Department's chairship has passed from Dr. Manley Perkel to Dr. Dan Voss (in summer 2004) and from Dr. Voss, who was named Associate Dean of CoSM, to Dr. Joanne Dombrowski (in summer 2006). At the college level, the position of Dean was passed from Dr. Roger Gilpin to Dr. Robert Weisman (2001), and thence to Dr. Michele Wheatly (2002).

? number of students served

By one measure, the Department serves essentially every undergraduate at Wright State University, of whom there are nearly *thirteen thousand* (fourteen-day report from Fall quarter 2007); this is so since there is a university-wide general education mathematics requirement, and many majors require well more than the single Gen Ed mathematics course.

The table below shows actual enrollment figures for all sections of all undergraduate courses the Department has taught during the most recent four quarters. They are *end-of-term* enrollment figures, which in some courses are notably lower than beginning-of-term figures; they include no courses taught at the Lake campus and no graduate courses whatever.

Winter 2007		Spring 2007		Summer 2007		Fall 2007		**Four-quarter total**
MTH	STT	MTH	STT	MTH	STT	MTH	STT	
2085	524	1966	426	314	93	2058	484	**7950**

? number of majors

58, as of Winter 2008

? number of minors

12, as of Winter 2008

? number enrolled in certificate program (if applicable)

No certificate program reviewed in this report

? number of faculty

The departmental faculty in the academic year 2007-2008 are as follows:

Professorial rank faculty, lecturers, and instructors, 2007-8	
Professors	15[2]
Associate Professors	8
Assistant Professors	6
Professorial rank subtotal	*29*[3]
Lecturers	6
Instructors	4
Non-professorial rank subtotal	*10*
Grand total	***39***[4]

The number of professorial rank faculty listed above will grow by four if all searches presently under way succeed and no retirements or other departures occur.

In addition, the Department has three staff members with significant instructional responsibility; has a varying number of graduate teaching assistants (at present, six); and has a highly varying number of adjunct faculty (at present, thirteen, two of whom are emeritus faculty). Finally, the Department employs a limited number of undergraduates to assist in instruction (e.g., to help fulltime faculty with instruction occurring in computer labs) and to grade papers in elementary courses.

? student/faculty ratio, average class size

The ratio of undergraduate majors to professorial rank faculty is presently exactly two-to-one. This extremely low figure is of course highly beneficial to our majors but also greatly misleading. The latter point is so simply because the large majority of instructional load borne by our Department is devoted to teaching students majoring in other disciplines.

Average class sizes in courses taken by our undergraduate majors range from around 30 (e.g., the average 14-day enrollment in MTH229, Calculus I, Spring 2007 through Winter 2008, was 27.6) to about 10 (over the same four-quarter period, average class size over all sections of 400-level courses that count for our majors was 10.3). However, the core courses taken by most or all our seniors typically run at about 20; also, total section sizes are a bit larger still since most courses at this level also act as beginning graduate courses (i.e., have 600-level “meets with” equivalents).

? balance in rank of program faculty

Please see the table above for specific information. The four searches presently under way are most likely to add three assistant professors to the count and one professor.

[2] 16, if one counts Dr. Dan Voss, who serves as Associate Dean of CoSM
[3] 30, if one counts Dr. Voss
[4] 40, if one counts Dr. Voss

? number of staff

The Department employs four classified staff: three are in the Department office (one Department Support Supervisor, one Administrative Specialist, and one Administrative Assistant) and one in the Statistical Consulting Center (a Statistical Services Specialist).

We have five professional (unclassified) staff. Of these, two are consultants in the Statistical Consulting Center (one fulltime, one approximately halftime), one is in the Department office (the Assistant to the Chair, who bears student affairs responsibilities and also teaches), and the remaining two have instructional and instructional program duties, and have individual offices much like fulltime faculty.

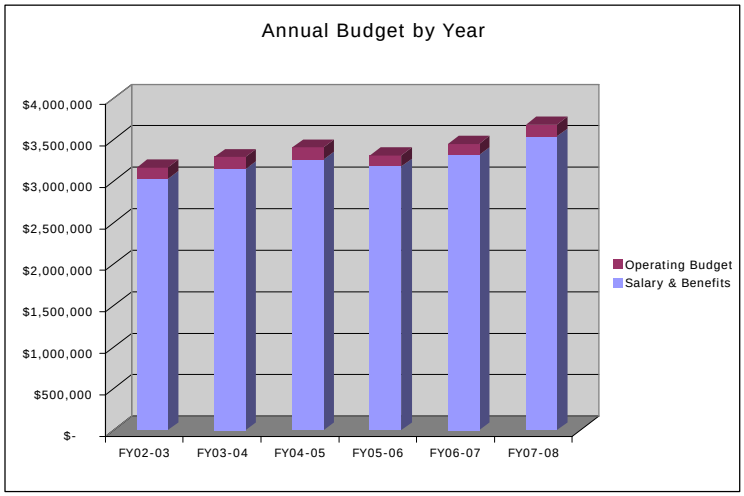
? diversity (gender, race, ethnicity) of majors, faculty, and staff

Category	Gender		Race/ethnicity			
	Female	Male	African-American	Asian	Caucasian	Unknown
Professorial rank faculty, lecturers, and instructors	16	23	2	12	25	0
Staff	9	0	2	0	7	0
Undergraduate majors	27	31	5	4	44	5

? budget

Please see the table below, or equivalently the accompanying chart.

Fiscal Year	Salary & Benefits	Operating Budget	Total
FY02-03	$3,027,258	$137,648	$3,164,906
FY03-04	3,149,214	142,955	$3,292,169
FY04-05	3,264,727	143,942	$3,408,669
FY05-06	3,177,862	133,344	$3,311,206
FY06-07	3,315,184	138,242	$3,453,426
FY07-08	3,540,215	143,093	$3,683,307



? facilities and equipment/instrumentation

Our faculty of course use the university's general purpose classrooms (some of which are so-called electronic classrooms, which might place them into this "facilities and equipment/instrumentation" category); and likewise our faculty and staff have access to the university's general computing facilities (the campus network and the Internet beyond, the WSU mail server, the WSU Unix server unixapps1.wright.edu, and the like). But aside from this brief observation, we do not report upon these here nor even comment upon the extent to which they are satisfactory.

Otherwise, the Department's "facilities and equipment/instrumentation" fall into two categories.

1. Computing

   First, the Department operates one instructional computer laboratory. Located in room 270MM, this lab is equipped with twenty-one computers (each a dual-CPU Power Macintosh G5) – one for the instructor and the rest for students – plus a pair of networked printers, a ceiling-mounted video projector, an Elmo document camera, video-audio-network hookups for a faculty laptop, controls to govern which of several sources will provide the projected image and audio, and finally an oversize projection screen. Students can be seated either on the room's periphery (where the computers are) or at mid-room tables. Thus this room is very highly desired by faculty who want a classroom that supports "multiple-mode instruction" – sometimes students work at the computers; sometimes they listen to a traditional lecture or engage in traditional question-and-answer with the professor; sometimes they work in small groups.

   (Let us add that a second computer lab, the PC lab in 170MM operated by CaTS and CTL, is in effect dedicated to the Department. Aside from the fundamental difference that one

finds PC's rather than Macs in 170MM, the equipment in 170MM is similar to that in 270MM.)

Second, the Department operates a number of servers. One is a very very old Macintosh that provides web service for the Department's site www.math.wright.edu; it is likely to be replaced soon. Another is a four-year-old Macintosh dual-CPU G5 "xserve" that provides data files and applications for the lab in 270MM, and secondarily provides auxiliary networked storage and backup space for faculty (as is needed since the supply of such space provided by CaTS is inadequate). The third is a rather old Unix server noether.math.wright.edu that functions as the Department's mail server and is used for research computations by some faculty.

Most of the funding for the above-named equipment was provided by the House Bill moneys that come to Wright State biennially. In particular, the computers in 270MM have been upgraded every four years for quite a long time; and the xserve machine noted above will shortly be replaced with already-approved House Bill funding.

Third, each fulltime employee is assigned a computer (Macintosh, PC, Linux "box", or Unix "box"). For professorial rank faculty, the frequency of replacement is roughly every three or four years, and the primary funding source is the office of the Provost (Faculty Computer Initiative funds) with supplements from CoSM and the Department itself. A small minority of faculty have more than one computer dedicated to their use, nearly all of whom have either unusually great professional computing needs or external funding.

2. Dedicated space

The Department's dedicated space includes 270MM (see item 1 above) and also the following.

- 202MM, our mathematics education "laboratory". This room is devoted to the instructional needs of the Department's mathematics educators (of whom we now have four at the professorial rank, with a search for a fifth in progress). Thus, in this room one often finds pre-service teachers gathered in small groups around the room's tables, working with "manipulatives" (e.g., geometric figures, tiles, etc.). This room is scheduled for an upgrade to electronic classroom status (computer for instructor, Elmo document camera, ceiling mounted video projector, controls) with House Bill funding that has been authorized for this purpose.
- 260MM, a small seminar room. This room is configured as a traditional "small" classroom (seating capacity about 25) and is used for a variety of departmental courses, notably the senior seminar that serves as a capstone course for all our undergraduate majors.
- 224MM, a seminar room. Though primarily intended for the faculty's research seminars and colloquia, this room is used on occasion for ordinary courses, review sessions, and the like.
- 222MM, the faculty-staff lounge. This room's primary use is indicated by its name. But it also serves as a gathering place for students and faculty, e.g. during advising open houses, end-of-year student/faculty socials, etc.
- 244MM, our study room and gathering place for undergraduate majors. This room is heavily used by the Department's undergraduate majors as a study room (group and individual) and secondarily as a social gathering place. Located in the MM building close

to faculty offices, it thus is immensely valuable to our students, facilitating our undergraduate majors meeting each another and *studying* with each other, a habit that is essential for the academic success of most students majoring in disciplines like ours. To put it another way, this room helps build a community of scholarship among our undergraduate majors.

- technology and information resources and services

First, please see item 1 above under "facilities and equipment/instrumentation."

The Department's assistant chair provides considerable computing support to the Department's faculty and staff, and manages (jointly with one of the other professorial rank faculty) the computer laboratory in 270MM and the two Macintosh servers described above. Another professorial rank faculty member manages the Unix server "noether" with as-needed help provided by CaTS.

The Department utilizes rather heavily the hardware repair and upgrade capabilities provided by the CoSM Electronics shop and is well satisfied with the quality and cost of service.

The Department utilizes rather heavily the services provided by CaTS and by CTL. Our level of satisfaction with the quality and cost of those services differs from instance to instance. However, our long term evaluation is that neither of these two service units does a particularly good job.

The Department has no staff dedicated to providing "technology and information resources and services". CoSM does provide hardware support via the Electronics shop but has no staff dedicated to providing software support.

- program cost

Please see budget information provided above. Importantly, the large majority of instruction provided by the Department supports other academic units; we teach many, *many* more students majoring in other departments than in our own. Therefore, only a fraction of the reported budget figures can be attributed to the Department's major programs covered by this report. To put it another way, the instructional mission of the Department is primarily that of a *service* department.

III. Program Effectiveness **(NCA Criterion 3 and Criterion 4)**

- achievement of student learning outcomes (Please summarize program assessment findings for past five years and subsequent improvements to program) **(3A)**

We list below the four learning outcomes and findings for each.

1. Advanced ability to reason logically

In exit interviews, students report that certain of our courses are especially helpful in this regard (e.g., MTH280 "Introduction to Mathematical Proof" and MTH491-2/STT492, our senior seminar "capstone" course). In surveys, faculty teaching senior-level courses for our majors typically report that a sizable majority of their students satisfy this outcome very well or fairly well.

2. Ability to communicate effectively the mathematics they have learned, in both written and oral form

Because our majors write extensively in virtually every departmental course beyond the mid-sophomore level, they have ample opportunity to acquire written communications skills in the majors; and in the capstone course, an additional opportunity regarding oral communication. Surveyed faculty report that most students satisfy this outcome fairly well or very well, with only a few rated not well.

3. Ability to read junior/senior level mathematical and/or statistical texts and papers

The predominant survey response is that students satisfy this outcome very well. In this outcome only, survey responses include a nontrivial number of "cannot judge" responses.

4. Understanding of the principles governing the mathematics and/or statistics they have encountered

Survey responses range from not well to very well, with more responses in the "not well" category for this outcome than for the other three. By the time our students enroll in our capstone course, the strongest (e.g., those bound for Ph.D. programs) have satisfied this outcome very well indeed, but the weakest have only attained it marginally.

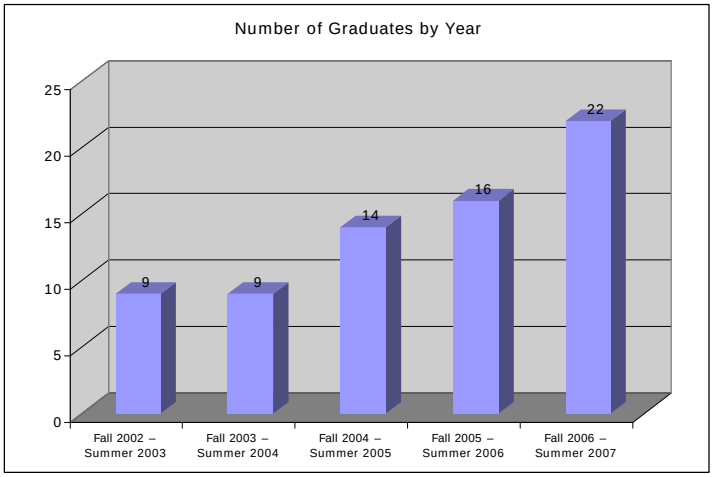
Finally, our faculty are constantly engaged in efforts to improve their own teaching, individual courses, and the curriculum overall.

- student retention rate **(3A)**

Data regarding the retention of the Department's undergraduate majors are not readily available.

- number of graduates annually **(3A)**

Please examine the following chart, in which we have displayed the total number of graduates of the undergraduate programs reviewed in this document. The reported numbers do *not* include students earning minors in our Department, nor those completing graduate programs, nor those in certificate programs.



- placement of graduates (e.g., employment, graduate study) **(3A)**

Our data on this point is largely anecdotal, as regular surveys of alumni have only recently begun, and responses have only begun to trickle in. However, we do observe a significant number of our stronger graduates having gained admission into respectable graduate programs. In fact, we have in recent years been successful in attracting some of our strongest undergraduates into our own graduate program. Moreover, as the demand for secondary school mathematics teachers is very strong, the graduates of our Mathematics Education Concentration (one of the tracks leading to the Mathematics B.S.) are essentially assured of good employment opportunities directly related to their chosen curriculum.

- teaching effectiveness **(3B, 3D)**

The Department's culture is one that values and nurtures high-quality teaching. We observe directly the classroom performance of our tenure-track faculty, and we help those who encounter difficulties. Though the Department's bylaws and tradition both require good teaching for promotion and tenure, it is rare for an assistant professor to not make tenure due to teaching deficiencies; but on the other hand when one has teaching problems that are not resolved, the Department can and in fact has voted to deny tenure (i.e., to dismiss).

Our faculty have garnered their fair share or more of teaching awards at the college and university levels. Likewise, the professional interests of a number of our senior faculty have migrated toward various endeavors in pedagogy, the infusion of technology into college teaching, and the like. Finally, with the addition of mathematics educators to our faculty, we have real experts in teaching and learning in our midst.

- faculty productivity (e.g., publications, grants) **(4A)**

The faculty's scholarly productivity continues to be high, especially for an institution offering no doctoral program in the mathematical sciences. For example, in 2006 (the most recent calendar year for which compiled data are readily available), the faculty published twenty-six papers and gave forty-one talks (twenty-four of which were invited).

Department faculty presently have external funding from major federal sources (at present, these include the National Science Foundation, the National Security Agency, the Air Force Office of Scientific Research, and the National Institute of Mental Health) and the Ohio Department of Education as well. Total funding of current grants exceeds a half-million dollars, not counting grants that are jointly held with faculty from other colleges.

The Department's faculty are successful in competing for scholarship-supporting resources internal to WSU as well. For example, three of our professorial faculty now hold year-long professional development leaves, and the same will be true of two others during the upcoming academic year.

- interrelations of program's teaching, research, service activities **(3A-D, 4A-C, 5 A-C)**

The Department holds to the academy's tenet that strong scholars make the best teachers, and in this fundamental sense the teaching and research missions of the Department are fundamentally linked. Please see "description of how program ensures that it is always current" below for more on this point. More, when it is feasible to do so, our faculty engage in joint research with their undergraduate students and even find support for them in grants.

Likewise, our Department is typical in that the scholarly work of our faculty position them for effective professional service, e.g., as referees and editors for journals, evaluators of grant proposals, and office-holders in professional organizations.

But beyond the above remarks, which of course apply to virtually all academic units at the University, one should consider the Department's mathematics educators. The very heart of their scholarly work is to improve teaching, to learn how learning works, and to pass that along to their students who wish themselves to become school teachers. Likewise their service activities are noteworthy in scope and strongly tied to their scholarship; please see "community engagement" above for particulars.

- integration of technology into curriculum and instruction **(3C)**

Just as is by now routine in almost every academic discipline, many faculty use electronic materials in classroom instruction. These range from the completely ordinary (PowerPoint etc.) to materials based on sophisticated mathematical and statistical software (*Mathematica*™, *Matlab*™, SAS, S+, etc.)

In addition, we report the following.

- Elementary mathematics courses

  As we have noted elsewhere in this report, every undergraduate major in our Department takes MTH229, 230, and 231 (Calculus I, II, and III) as the first-year courses

in the major. Every section of these courses is scheduled for approximately 100 minutes per week in one of the two computer laboratories (170MM and 270MM) described above under “facilities and equipment/instrumentation”. Many faculty teaching these three courses utilize instructional materials developed by departmental faculty some years ago with National Science Foundation support; these materials depend upon the powerful software *Mathematica*™ software, and they provide students with ways to understand calculus centered on *graphs* and *numerical tables* that parallel the symbolic-manipulation (algebraic) approach utilized exclusively in traditional instruction. Others use materials they develop themselves; a few use the computing equipment only in a limited way.

(Let us add that our computer labs are used in a like fashion for various elementary courses taught to students majoring in *other* departments. Thus we do not report upon those here.)

- Applied statistics courses

  Department faculty have adopted SAS (a powerful and very widely used statistical data analysis program) in STT466/467 (Statistical Methods I and II), the basic applied statistics courses taken by all students in the statistics B.S. program. According to instructor preference SAS or other statistics packages (e.g., Minitab, S+, ETS “Experimental Time Series”) are used in more specialized applied statistics courses, such as STT411 (Applied Time Series), STT424 (Statistical Quality Control and Improvement), and STT464 (Computational Statistics).

- description of how program ensures that it is always current **(4C)**

Most faculty are actively engaged in research and scholarship, and regularly attend conferences on research, technology, and teaching. Weekly research colloquia and a visiting scholars program bring high-caliber visitors to campus, providing another means for our faculty to stay abreast of developments in their various fields of study, and to develop contacts with scholars at other institutions. Memberships in professional organizations (the American Mathematical Society, the Mathematical Association of America, the Society for Industrial and Applied Mathematics, the American Statistical Association, the National Council of Teachers of Mathematics) provide further resources (conferences, journals, bulletins) for maintaining currency. Professional development leaves provide further opportunities for faculty to spend extended periods of time at other institutions.

The opportunity to hire new faculty at regular intervals brings not only new scholarly expertise but also new ideas in curriculum and instruction.

- “comparative advantage” (e.g., distinctiveness in terms of students served, differentiation from programs offered at other regional institutions, strengths attributable to collaborative/interdisciplinary nature of program, etc.)

The Department offers several tracks leading to an undergraduate degree: B.A. in Mathematics; B.S. in Mathematics with tracks (concentrations) in Pure Mathematics, Applied Mathematics, Computing, and Mathematics Education; and the B.S. in Statistics. Thus, our programs accommodate a wide variety of objectives associated to the study of mathematics or statistics.

These programs are supported by a strong faculty. With the exception of Ohio State and Case Western, and the possible exception of the University of Cincinnati, our Department is a contender for the strongest group of researchers in the mathematical sciences in Ohio. Thus we are able to compete for new faculty of remarkable quality.

The Statistical Consulting Center is a unique and highly valuable resource, fostering quality scholarship in the multitude of disciplines dependent on statistics and acting as a training center for statistics graduate students.

For prospective high school mathematics teachers, we offer not just the required degree program but faculty who are leaders in Ohio's efforts to improve mathematics instruction in the public schools.

It is widely agreed that learning mathematics requires active student participation: students must be actively engaged in constructing knowledge, not passive receptors of lectures. In particular, most students in mathematics and statistics classes need ready in-class access to their instructors and regular feedback in the form of graded homework, exams, etc. Large class sizes are a major impediment to both. Therefore the Department does not teach in the large lecture format. See the section on average class size for more detailed information.

Classes taught to our majors, from MTH229-230-231 on up, are almost always taught by professorial rank faculty. Thus, it is very likely that an undergraduate major in our Department will never take a mathematics or statistics class from anyone other than a Ph.D.-holding tenured or tenure track faculty member at the rank of Assistant Professor, Associate Professor, or Professor. Likewise, our undergraduates are advised by professorial rank faculty; they engage in honors projects and independent study directed by these faculty; and we provide our undergraduates with a study room that is very convenient to faculty offices.

If the program is online, respond to the following questions **(drawn from NCA Best Practices)**:

- Is the online program taught by the same faculty as the on-campus program?
- How do the retention and graduation rates of the online and on-campus programs compare?
- How does the achievement of learning outcomes by online students compare with those by on-campus students?
- How does student evaluation of instruction for online classes compare to that for on-campus courses?
- How does the online program provide for appropriate interaction (synchronous or asynchronous) between students and instructor and among students?
- How does access to academic and technical support programs compare for online and on-campus students and for online and on-campus faculty?
- How does the program provide a coherent plan for student access to all courses necessary to complete the program (or provide clear notification of requirements not included in electronic offerings)?
- How have issues of workload, compensation, and ownership of intellectual property been addressed by the program?
- How have issues of security of personal information been addressed?

Not applicable.

IV. Program Needs/Areas in Need of Improvement

Summarize the program needs (e.g., personnel, facilities, equipment) identified in this program review and the areas in need of improvement.

Faculty size, faculty recruitment, and faculty retention

Recruiting and retaining quality faculty is essential to the overall success of the Department's programs. We have been successful in recent years in recruiting high caliber faculty. For example, our two most recent hires received their Ph.D. training at Cal Tech and Wisconsin. We are optimistic about concluding three searches now in progress with hires of like caliber. Still, it remains a challenge to recruit and retain high quality faculty, since they do have opportunities in distinguished Ph.D.-granting departments.

Filing all of our open positions will certainly better enable the Department to meet its larger teaching mission. However, even then we will still rely heavily on adjunct faculty to meet the demand for our courses, most of which comes from other disciplines. Thus there remains a need for additional professorial rank positions.

Responding to STEM initiatives

As is true for mathematical sciences departments at other universities in Ohio, our Department welcomes Ohio's support of various STEM (science, technology, engineering, mathematics, medicine) initiatives, and likewise we are hopeful that Ohio's economic troubles will not significantly curtail the additional support that must accompany such initiatives in order for them to succeed. Thus our Department accepts the challenge of recruiting more undergraduate majors and facilitating their success (and likewise facilitating the success of the many WSU undergraduates majoring in other departments whose curricula entail substantial coursework in our Department).

Let us elaborate on two specific facets of this challenge.

One of the challenges in attracting new mathematics majors is that students often choose a major based on a clear relation to a career path: what sort of job can I expect after I graduate? On the other hand, few directly associate *mathematics* or *statistics* with a career; compare with *nursing* or *accounting* or *engineering*, words that name not just college majors but also jobs. Thus, it behooves our Department to try to convey the career-related virtues of the programs reviewed in this document, both to WSU undergraduates and to students in the many high schools that feed their graduates to our University.

Second, successful college mathematics majors need to have had strong high school preparation. Therefore it behooves our Department to work toward improving the caliber of mathematics instruction offered in the public schools, especially those that supply WSU with students.

Instructional support: classroom space, technology, and supplies

The Department has experienced problems in scheduling classes due to shortages of appropriate classroom space. Likewise, our faculty have often found that the classrooms in which they have been assigned to teach are inadequate for instruction in the mathematical sciences. These are significant impediments to the Department's

instructional mission, not just for our own majors but also for all the other students who take our courses annually.

It is also important that classrooms be equipped with needed instructional equipment and stocked with needed teaching supplies.

Computing support

Adequate computing support from extra-departmental units is important for two reasons. First, such support is essential for our faculty to provide quality instruction. Secondly, most such support can be more economically provided at higher (college or university) levels.

Operating budget

Please see the budget tables above. There, one finds that the Department's operating budget remained essentially flat (3.96% growth) over a period of time during which prices in general rose considerably (CPI rose 15.3% 2002-2007). Budget-cutting episodes over the years combined with the Department's penchant for frugality already have resulted (for example) in the absence of office telephone service for adjuncts, GTAs, and Instructors, likewise the absence of voice mail service for anyone in the Department, and reductions in academic support services such as paper-grading in elementary courses. Budgets that do not even keep up with basic inflation result in significant real reductions in what the Department can do to support its faculty and teach its students.

V. Proposed Improvement Action Plan

Summarize the actions that will be taken in response to the findings of this program assessment. Provide a timeline that indicates how these changes will be implemented and assessed over the next seven years.

The Department is implementing various initiatives to make students aware of the opportunities to major in the mathematical sciences at WSU, and the many good reasons to do so. For example, we communicate with current WSU students who do well in elementary courses, and we send representatives to various forums in which the undergraduate curriculum of our Department are displayed.

We continue to support our mathematics educators and their goals to improve the caliber of teachers and the teaching in the public schools. Their work perhaps carries the best long-term hope for success in bringing more students into STEM disciplines. The Department's success in this regard will be revealed primarily by the number of majors we graduate.

The Department continues to support faculty efforts to improve instruction. Some of these entail external grant funding and inter-college collaboration, in which case assessment is typically built in to the grant-funded projects.

Importantly, the Department will continue to build a strong department and to hire the strongest faculty that we can, faculty who will excel in teaching and scholarship alike. Likewise, we will lobby for additional positions when they are needed to support the overall mission of the department. Our goals are to reduce reliance on non-professorial faculty (especially adjuncts), to continue to offer courses with suitably small class sizes, to staff enough sections of the

appropriate courses to meet student needs, and to provide some flexibility to respond to initiatives and opportunities for long-term growth.

In general, our Department expects to continue in its tradition of seizing opportunities for improvement and advancement as they arise and meeting new challenges.