Department of Mathematical Sciences

To: Enrico Pontelli, Dean, Arts and Sciences

From: Joseph Lakey, Academic Department Head

Date: 17 November 2017

Subject: Department Summary and Analysis for 2016–2017 and Goals for 2017–2018

Mission Statement

The Department of Mathematical Sciences provides core education in mathematics and statistics that prepares graduate and undergraduate students to be knowledgeable and responsible citizens of the world. It does this by conducting research, scholarship, and teaching, including teaching service courses for other programs, to fulfill the land grant mission of the university.

Personnel Changes

The Department of Mathematical Sciences had one resignation, that of Shibin Dai, who was offered a position at the University of Alabama just after a successful tenure decision. The department was able to do a tenure-track hire and will have Jonathan Moñtano join the faculty in Fall 2018 after completing a postdoctoral appointment at the University of Kansas. The number of new and continuing faculty in 2016–2017 was 21 tenure-track (-1) and 7.5 FTE college-track (-1) relative to 2015–2016. For 2017–2018 the faculty will number 20 tenure-track and 7.5 college-track.

Sabbaticals and course coverage While the total number of faculty in the department was diminished, several faculty returned from sabbaticals in 2016–2017 and only a single faculty member, Pat Baggett, took a sabbatical in (Fall) 2016. Consequently, the department required only five temporary instructors (Hadian-Dekhordi, Dytzel, Benkhalti, Neumann, Bulger-Tamez, Alhalholy) and one full-time teaching visitor (Baokun Li) to cover 15 courses in the Fall semester. Li and a single temp covered 5 courses in the Spring that could not be covered by regular faculty and GA assignments.

Summary of Department Accomplishments

Externally Funded Activities. According to 2015 HERD data, NMSU's Department of Mathematical Sciences ranked only 206 in total R&D expenditures, down from 118 in FY2014 and a long way down from an inflated ranking in the upper 20's a few years ago when LIFT was funded at $1M/yr. Total 2015 expenditures were listed as $274K ($216K federal) versus $2.3M ($2.2M federal) in 2012. Numbers for 2016 and 2017 should be

similar to those for 2015 but, preliminary numbers for 2018 are not encouraging, as several funded programs ended in 2017.

Faculty involvement in external funding will be reported as follows. First new, ongoing and closeout ARGIS funding will be reported. Non-Argis funded programs will be identified next with information on funding agency and home institution, including NMSU for non-PI senior personnel. Proposals declined or under review in 2016–2017 will then be reported to give a comprehensive view of faculty involvement in external funding and its pursuit.

New funding beginning in 2016–2017
Cahill, J. (Co-Principal), **Lakey, J. D.** (Principal), Sponsored Research, "CBMS Conference: Sparse Approximation and Signal Recovery Algorithms", Sponsoring Organization: National Science Foundation, Sponsoring Organization Is: Other, Research Credit: $19,199.50, PI Total Award: $38,399.00, Funded January 1, 2017 - December 31, 2017.

Contreras, A. (Principal), Sponsored Research, "Topological-Defects in Nonlinear Elliptic Problems", Sponsoring Organization: Simons Foundation, Sponsoring Organization Is: Other, Research Credit: $35,000.00, PI Total Award: $35,000.00, Funded September 1, 2016 - August 31, 2021).

Kanim, K. W. (Co-Principal), Matthews, L. R. (Co-Principal), Bulger-Tamez, W. M. (Principal), **Morandi, P. J.** (Co-Principal), Sponsored Research, "FY17 MSP PED-MC2", Sponsoring Organization: NM Public Education Department, Sponsoring Organization Is: Local, Research Credit: $120,311.40, PI Total Award: $1,203,114.00, Funded April 7, 2017 - September 30, 2018.

Ongoing funding beginning in 2016–2017
Fouli, L. (Principal), Sponsored Research, "Parameters, Blowup Algebras and Connections to Combinatorics", Sponsoring Organization: Simons Foundation, PI Total Award: $35,000.00, Funded Sept. 1, 2012 - Aug. 31,2018).

Lodder, G. (Principal), Sponsored Research, "Collaborative Research: RUI: Transforming Instruction in Undergraduate Mathematics via Primary Historical Sources", Sponsoring Organization: National Science Foundation, PI Total Award: $115,011.00 Funded August 1, 2015 - July 31, 2020)

Longo, **N. P. Michalowski** (Principal), Sponsored Research, "Collaborative Research: Branching Markov Chains and Stochastic Analysis Associated with Problems in Fluid Flow", Sponsoring Organization: National Science Foundation, PI Total Award: $81,639.00, Funded July 1, 2014 - June 30, 2018.

Trujillo, K. M. (Co-Principal), Chamberlin, B. A. (Co-Principal), **Stanford, T. B.** (Co-Principal), Wiburg, K. (Principal), Sponsored Research, "Math Snacks for Early Algebra - Using Games & Inquiry to Help Students Transition from Number to Variable", Sponsoring Organization: National Science Foundation, Research Credit: $179,999.70, PI Total Award: $2,999,995.00 Funded September 1, 2015 - August 31, 2019.

Ashley, A. (Co-Principal), Sanchez, J. I. (Co-Principal), Loest, H. B. (Co-Principal), Smeal, D. (Other), Sanchez, J. I. (Co-Principal), Loest, H. B. (Co-Principal), Ashley, R. (Co-Principal), Houston, J. P.(Co-Principal), Jim, J. M. (Co-Principal), **Tian, J. P.** (Co-Principal), Palacios, R. (Co-Principal),Ashley, A. K. (Co-Principal), Unguez, G. A. (Co-Principal), Lombard, K. A. (Co-Principal), Shuster, M. (Co-Principal), O'Connell, M. A. (Principal), Sponsored Research, "Partnership for the Advancement of Cancer Research: NMSU/FHCRC", Sponsoring Organization: US Department of Health & Human Services/National Cancer Institute/NIH(DHHS), Research Credit: $546,627.47, PI Total Award: $5,114,643.00, Funded September 25, 2013 - August 31, 2018.

Funding ending in 2016–2017
Dai, S. (Principal), Sponsored Research, "Degenerate Diffusion in Complex Amphiphilic Structures", Sponsoring Organization: National Science Foundation, PI Total Award: $186,486.00, Funded August 15, 2014 - July 31, 2017.

Harding, J. (Principal), Sponsored Research, "Events as Decompositions", Sponsoring Organization: Foundational Questions Institute, PI Total Award: $44,330.00, Funded Sept. 1, 2015 - July 31,2017.

Lakey, J. D. (Other), **Tian, J. P.** (Principal), Sponsored Research, "Collaborative Research: New Formulation & Algorithms for Fluid-Structure Interaction with Application to Tumor Growth", Sponsoring Organization: National Science Foundation, PI Total Award: $111,511.00, Funded May 21, 2014 -August 31, 2017.

Kanim, K. W. (Co-Principal), Matthews, L. R. (Co-Principal), Bulger-Tamez, W. M. (Principal), **Morandi**, P. J. (Co-Principal), Sponsored Research, "FY16 MC2 PED", Sponsoring Organization: NM Public Education Department, Research Credit: $130,018.50, PI Total Award: $1,300,185.00, Funded Oct. 19, 2015 - Sept. 30, 2017.

Bulger-Tamez, W. M. (Principal), **Morandi, P. J.** (Co-Principal), Sponsored Research, "FY15 MC2 PED", Sponsoring Organization: NM Public Education Department, Research Credit: $119,893.60, PI Total Award: $1,198,936.00, Funded October 6, 2014 - September 30, 2016).

Tian, J. P. (Principal), Sponsored Research, "Internal Award - Yr 9 PARC P8 Solid Tumor", PI Total Award: $69,713.00, Funded. (September 1, 2016 - August 31, 2017).

The faculty of Mathematical Sciences were involved in other *non-ARGIS funding* either as co-PIs on grants administered through other universities or as senior personnel (non-co-PI) on ARGIS grants. Here is a partial list of programs that were reported by faculty on their annual reports.

Guram Bezhanishvili, "Propositional calculi for topology and geometry," Shota Rustaveli National Science Foundation (Georgia), $86,326.00, Funded January 2017–January 2020.

Guram Bezhanishvili, John Harding, Pat Morandi, Bruce Olberding. "SYSMICS: Syntax meet semantics: methods, interactions, and connections in substructural logics," Horizon 2020 (European Union), Description: Grant funds more than 50 researchers in 23 universities worldwide (13 countries involved). PI: Luca Spada, University of Salerno. Total Award: € 504,000.00., Funded March 2016–March 2019.

Louiza Fouli (senior personnel) "iCredits: interdisciplinary Center of Research Excellence in Design of Intelligent Technologies for Smartgrids," National Science Foundation, $4,999,721.00, Funded Feb. 1, 2014– Jan. 31, 2019.

Louiza Fouli (co-PI) "Southwest Local Algebra Meeting 2017," National Science Foundation, $15,130.00 (University of New Mexico), Funded January 1, 2017– December 31, 2017.

Louiza Fouli (co-PI) "Southwest Local Algebra Meeting 2016," National Security Agency, $14,925.00, (Texas State Univ.) Funded January 1, 2016–December 31, 2016.

Tiziana Giorgi, "Travel Award," American Mathematical Society, $1,350.00, Funded July 24-28, 2017.

Cao, H. (Co-Principal), Cao, H. (Co-Principal), **Villaverde, K.** (Co-Principal), Pontelli, E. (Principal), Sponsored Research, "BPC-AE: Computing Alliance of Hispanic-Serving Institutions (CAHSI) - Renewal", Sponsoring Organization: University of Texas at El Paso, Research Credit: $21,991.42, PI Total Award: $263,897.00, Funded May15, 2011 - May 31, 2018.

The faculty of Mathematical Sciences were involved in other ARGIS grant application either under review or not funded. Here is a partial list of programs that were reported by faculty on their annual reports.

Dai, S. (Principal), Sponsored Research, "CAREER: Complex amphiphilic structures and the functionality of nanoparticles and biomaterials", Sponsoring Organization: National Science Foundation, PI Total Award: $472,385.00, Currently Under Review. (July 1, 2017 - June 30, 2022).

Dai, S. (Principal), Sponsored Research, "Mechanisms of action and antimicrobial efficacy of insect wing nanopillars", Sponsoring Organization: Idaho State University, PI Total Award: $325,122.00, Currently Under Review. (March 1, 2017 - February 28, 2022).

Dai, S. (Principal), Sponsored Research, "Collaborative Research: Complex Amphiphilic Structures and the Functionality of Biomaterials", Sponsoring Organization: National Science Foundation, PI Total Award: $227,345.00, Not Funded. (July 1, 2017 - December 31, 2017).

Altogether, all but seven of the 21 ongoing tenure-track faculty members were involved in externally funded activities in 2016-2017, but only five were not involved in 2015–2016.

Research and Creative Activity (2016-2017). Output measured by publications was lower than last year, which was a banner year in this respect, but 2016-2017 was comparable to the prior three-year average. The total number of journal articles listed as published or in press in 2016–2017 faculty APRs was 40, not counting duplicated authors within the department. In 2015–2016 there were 44 unique *published* journal articles (with an additional 15 in press). In addition, 12 book chapters and four conference proceedings papers were published or in press in 2016–2017, about half the production of the previous year if including completed books. This fluctuation is reasonable and might partly reflect a couple of incomplete APRs. As in previous years, there was substantial variation in numbers of publications with one faculty member listing more than 10 articles published or in press, and six others listing four or more articles, but six not listing any articles published or in press (again, possibly a result of under-reporting). Also as in recent years, most (but not all) of those publishing less have been very to extremely active in service and outreach, effectively creating time for those who were able to produce more creative work.

Other Scholarly Activities (2015–2016). As in 2015-2016, the department had a remarkably active year in terms of **colloquia** and **research visits**. The colloquium schedule included three speakers from NMSU, Hung T. Nguyen (Prof. Emeritus): The p-value crisis, 11/ 1; Robert Smits, *From Discrete to Continuous: The Magic of the Generating Function*, 11/3; and David Trafimow, Department of Psychology, *Why I Dislike the Null Hypothesis Significance Testing Procedure*, 12/1. It also included three interview colloquia in early spring, including Thanh Vu, Hanoi University of Science and Technology *Free Resolutions of Product of Linear Ideals Over Quadratic Hypersurfaces*, 2/2; Jonathan Montaño University of Kansas, *Counting Lattice Points and Limits in Commutative Algebra,* 2/9; and Russ Woodroofe, Mississippi State University, *A Broad Class of Shellable Lattices*, 2/16. Other colloquia involved visitors from regional to international universities: Anna Romanowski Warsaw University of Technology, *An Algebraist's View of Convexity and Duality* 9/15/16; Wei Wang, Xi'an Shiyou University, Xi'an, China, *Fuzzy Filters of the Logical Algebras* 9/ 29/16; Mingji Zhang, New Mexico Institute of Mining and Technology, *Individual Flux Study via Steady-State Poisson-Nernst-Planck Systems: Effects From Boundary Conditions* 10/6/16; Chun-Kit Lai, San Francisco State University, *Exponential Bases and Frames on Fractals* 10/20/16; Lidia Mrad Arizona State University, *Liquid Crystal Defects: Chevron Structures*, 10/27/17; Peter Casazza, University of Missouri, *Phase Retrieval ,* 11/10/17; Sam van Gool, City College of New York, *Pro-aperiodic Monoids via Saturated Models*, 1/26/17; Xiang

Xu, Old Dominion, *Some analytic results on the Beris-Edwards system modeling liquid crystal flows*, 3/9/17; Art Duval, UTEP, *A non-partitionable Cohen-Macauley simplicial complex*, 3/16/17; Hanchun Yang, Yunnan University, Kunming China, *Developments and applications of delta shock waves*, 4/617; Saolo Orizaga, University of Arizona, *Instability and Reorientation of Block CoPolymer Microstructure of imposed electric fields*, 4/13/17; Tai Melcher, University of Virginia, *Smooth measures in infinite dimensions*, 4/27/17; and Boris Choy, Sydney University, Australia, *A Flexible Class of Bivariate Distributions: Estimation and Applications,* 5/2/17. Colloquium activity will fall off dramatically in 2017–2018.

Two of the colloquium speakers, Wang Wei and Hanchun Yang, were on extended collaborative research visits to NMSU. The department hosted other long-term research visitors from China including Baokun Li, on sabbatical from Southwest University of Finance and Economics Chengdu, China; Ms. Xiaoting Zhang, Department of Information Systems, College of Information Engineering Northwest A&F University, Yangling District, Shaanxi Province, China, in March 20, 2016 until March 19, 2017 and Ben Niu from Harbin Institute of Technology, Weihai. Other multi-week research visits were made in conjunction with the SYSMICS grant noted above.

Awards, Recognitions and Leading Scholarly Service, 2015-2016. Jianjun Paul Tian was recognized with an *Arts and Sciences Outstanding Faculty Research Award* in Spring 2017. Several faculty were recognized for their work through invitations to speak at major conferences worldwide, some of which are mentioned below.

Other evidence of the reputations of our faculty can be found in their professional obligations. Several faculty served on **Editorial Boards** of scholarly publications, including Pat Baggett, *European Journal of Mathematics and Science Education*, Guram Bezhanishvili, *Journal of Language, Logic, and Computation*, Rocky Mountain Journal of Mathematics, *Tbilisi Mathematical Journal* and *Studia Logica*, Louiza Fouli, *Rocky Mountain Journal of Mathematics* (eff. May 2017), John Harding, *Order*, Pat Morandi, *Journal of Algebra and Computational Applications*, Bruce Olberding, *Journal of Commutative Algebra*. Bezhanishvili also served on scientific committees for four different conference series (TACL, TOLO, TbiLLC and BLAST). Some faculty members reported writing external review letters for promotion and tenure cases at other universities, or serving as external evaluators of doctoral dissertations. Such activities were not always listed on APRs but should be, with an effort to maintain confidentiality when appropriate.

John Harding served as Vice President (former president) of the *International Quantum Structures Association* that has members in 26 countries in five continents.

Several members of the department were involved in **organization of conferences** and workshops. Andres Contreras organized the special session, *Finite and Infinite Dimensional Hamiltonian Systems* at the Mathematical Congress of the Americas in Montreal, July 24-27. Louiza Fouli co-organized the *Southwest Local Analysis Meeting* in Albuquerque, March 4-5; Tiziana Giorgi coorganized the special session *Singularities and Phase Transitions in Condensed Matter* at the Mathematical Congress of Americas, July 24-28 and is currently co-

organizing a session of a major SIAM meeting. John Harding organized the *Topology, Algebra, and Categories in Logic conference* held in Prague in June 2017.

Conferences held at NMSU included the *Conference on Teaching with Historical Curricular Modules*, (Lodder, March 24-25); the *20th Joint NMSU/UTEP Workshop on Mathematics, Computer Science, and Computational Sciences* (Villaverde and Wang, April 8); and the *CBMS Conference on Sparse Signal Recovery*, May 22-26 (Cahill, Lakey and Michalowski).

Several faculty members **presented** their work at **international** conferences, workshops and seminars in 2016-2017, including Guram Bezhanishvili at Advances in Modal Logic 2016 in Budapest, 8/16; Andres Contreras at the Mathematical Congress of the Americas in Montreal, 7/16 and at the Applied Analysis seminar of the Max Planck Institute in Leipzig, 12/16; Tiziana Giorgi at the Mathematical Congress of the Americas in Montreal, 7/16; John Harding at the ELLSSI Conference in Toulouse in July (course on Lattice Theory), at the Joint QPL/IQSA meeting, IQSA, Nijmegen in July, and at the TACL conference in Prague in June; Joe Lakey at the SampTA conference in Tallinn in July; Pat Morandi at TACL in Prague in June; Robert Smits at the University of Costa Rica in March (partly for recruiting), and Tony Wang in China (Yangling, Chengdu, Xi'an (3), Shaanxi (2) and Huhehot, and Thailand (Chiangmai) in Summer 2017, partly for recruiting.

A number of external **domestic presentations** were also given by Baggett (NCTM, San Antonio 4/17 and Joint Math Meeting (JMM), Atlanta 1/17); Bezhanishvili (AMS Denver, 10/16); Cahill (SFSU Math Colloquium, 2/17); Contreras (AMS, CUNY 5/17); Dai, who had at least four campus interviews in 2016-2017; Fouli (Purdue, 10/16); Giorgi (UNM, 4/17; AMS Indiana 4/17; JMM 1/17; AMS Brunswick ME, 9/16); Lodder (Denver, 9/16; Mathfest, Chicago 7/17; JMM (2), 1/17); Salamanca-Riba (Univ Utah, 7/17; SLAM-UNM, 3/17); Stanford (Santa Fe, 3/17). Several faculty and graduate students also presented their work at local workshops such as the NMSU/UTEP workshop, and in departmental seminars such as the Analysis Seminar that was organized by Giorgi and the Algebra Seminar that was co-organized by Bezhanishvili, and some graduate students presented nationally, particularly at MathFest.

The total number of presentations, both international and domestic, is down a bit from 2015-2016 when a large number of faculty members were on sabbatical.

University Service and Outreach. Department faculty service to Arts and Sciences and to the university as a whole continues to be down a bit from three or four years ago, although a few faculty members have been very active. Current membership on Arts and Sciences Committees according to the A&S web page includes Linda Zimmerman (College-track promotion); Mary Ballyk (Faculty Affairs); Tiziana Giorgi (Graduate Affairs); Abby Train (Staff Awards); Pat Morandi (Research Affairs, Chair); and John Harding is the A&S representative on the University Research Council. Pat Baggett also listed membership on the A&S Awards Committee in 2016–2017 on her APR.

There is also ample representation of Professors and College Professors as external membership of A&S department P&T Committees, including Bezhanishvili (CJ); DeBlassie

(Anthropology); Fulte (Physics CT); Giorgi (Geology, as of August); Morandi (Psychology); Mostafa (Biology CT); and Olberding (Philosophy).

University-level service that was reported on APRs includes Ballyk and Train on the Interstate Passport Project, the NMHED Mathematics Common Course Numbering Subcommittee, and the Center for Peer Learning Assistants Board; Fulte on the Faculty Grievance Review Board and the New Mexico Articulation Task Force; Lakey on Team 6; Lodder on the General Education Course Certification Committee; Morandi on the Faculty Senate and its University Affairs Committee, and the Provost's General Education Task Force; Smits as a faculty representative on the A&S Dean Search Committee; Stanford on the statewide Math Teacher Education Partnership. Tony Wang represented the university in recruiting in China, particularly in setting up a 2+2 program with Donghua University in Math and coordinating a corresponding program in Physics. Wang will seek similar partnerships with other universities in China. Morandi did not seek reappointment to Faculty Senate at the end of his term in May. The department has no representation on Faculty Senate now. This is unfortunate as the department will have substantial interest in upcoming matters, including potential realignment of academic units.

Faculty reported a variety of **outreach** activities. Mary Ballyk and Pat Morandi's ongoing involvement in the MC^2 program is largely outreach, involving interaction with around 400 Math teachers in schools statewide. Pat Baggett continues to host several classes from Sierra Middle School a couple of times a year to do some hands on mathematical activities in SH 235. Laura White-Hosford ran some structured lessons at Columbia Elementary and involved several of her Elementary Math students (preservice teachers) in STEM nights and Fall Festivals at Columbia Elementary and Sonoma Elementary. Lakey also participated in a STEM night at Valley View Elementary and a Career Day at Loma Linda Elementary. Lodder did some curricular related outreach leading a workshop at UC-Denver involving training instructors in the uses of historical source related curricular modules. Smits and Wang were involved in recruitment related outreach in Costa Rica and China respectively. Salamanca-Riba and Lakey do alumni-related outreach by providing information and informal interviews for prospective students for MIT and U. Chicago respectively. Some of these students have NMSU as a backup plan. Amal Mostafa served as a judge for the Southwestern New Mexico Regional Science and Engineering Fair.

Student Credit Hour production. Enrollments in MATH/STAT courses declined for the fourth consecutive year. Fall census numbers for 2013—2017 were 13,423, 13,203, 12,692 and 11,974, and 11,763 respectively. The largest percent declines came in lower division, 11,718 in 2013 and 10,301 in 2017, a 12% decline relative to 2013. Graduate enrollments were 442 in Fall 2013 and 319 in 2017, ostensibly a 28% decline relative to 2013, but most of the graduate decline came from an artificial bump in SCH in 2013 funded externally by NSF through the LIFT program. The lower division decline is somewhat mitigated by the department introducing AS 103 in Fall 2016 at the request of the Provost. AS 103 has 204 students (612 SCH) in Fall 2017 compared to 133 students (399 SCH) in Fall 2016. The department was not provided additional instructional resources to run AS 103. Instead, Abby Train worked closely with Villaverde and Zimmerman to develop an ALEKS-based

course to prepare students for MATH 120 and beyond. This created some additional need for temporary instruction, particularly in the Fall when student demand for MATH courses is higher. The department has not been able to run as many advanced graduate courses. This cycle may have started because of inadequate instructional resources but seems to have developed into a spiral of decreasing graduate enrollments, possibly also due to non-competitive graduate funding. Upper division enrollments are also down moderately from 1263 to 1143 relative to 2013. Holding steady will be difficult to sustain as Engineering will no longer require key prerequisites (MATH 291G for EE and MATH 392 for ME) for several upper division MATH classes. In addition, the College of Education no longer requires its secondary math majors to take MATH 331 and 332, which are core courses for our general track and equivalent to required courses for secondary math educators nationwide. The decrease in lower division credits has been accompanied by a veritable race to the bottom exemplified by the addition of and increasing enrollments in AS 103. Numbers of sections for Fall 2017 (relative to Fall 2016, 2015, 2014 and 2013) are as follows: MATH 120: 13 (-1,-1,-,+1); MATH 121G: 16 (--,+1,+1,-2); MATH 190G: 7 (--,--, -1, -2); MATH 191G: 8 (--,+2,-1,-1); 192G: 4 (-1,-1,-2,-2); STAT 251G: 8 (--,--,--,+1). The silver lining, if there is one, is that we are holding steady in the past year, particularly at the 190G and 191G level.

As in recent years, the College Faculty members of Mathematical Sciences continue to process very heavy loads in 2016–2017, including Ausbrooks (1035 SCH), Fulte (1023 in-load), Mostafa (1296 in-load), Stuart (1239), Villaverde (888), White-Hosford (903) and Zimmerman (1203). Some tenure-track faculty members are also taking on larger loads by virtue of teaching large lecture courses (Ballyk, 951 SCH; Lakey 778 SCH; Olberding 709). Not all faculty taught a high load in terms of SCH. Two taught below 200 SCH (but with a large proportion at the graduate level) and two more below 250 SCH. Most tenure-track faculty taught between 350 and 400 SCH in 2016–2017.

One bright point was our calculus instruction in 2016-2017. In Fall, 7 of 8 sections of MATH 191G and 4 of 5 sections of 192G, and in Spring 2017, 6 of 7 sections of MATH 191G and 5 of 6 sections of MATH 192G (including 192GH) were taught by regular faculty, an even mix of college and tenure track. And the four large sections of MATH 142G, two each in Fall and Spring, were taught by Olberding and Ballyk both semesters. Overall, students rated their calculus instruction as significantly better than in recent years, despite documenting a high level of challenge, and Mary Ballyk was able to report that scores on readiness exams in all calculus courses have improved steadily over the past three semesters. Pass rates in these courses were down a bit, but except in one or two instances this does not appear to reflect higher expectations faculty might have. The perceived improvements in student learning have not come without a cost to some of our upper division instruction.

Majors and Degrees. The department produced three PhD's in 2016–2017: Francisco Avila (Morandi), Jose Eduardo Tintos-Espinosa (Lodder) and Ray Paulino (Fouli). Avila is currently working as a lecturer at UTEP, Tintos as a temporary instructor in Mathematical Sciences, and Paulino has a position at University of Guam. The two-year average of 2.5 PhDs per year is down from the five-year average of about 4.5, but that number is probably

unreasonably high for a department that has not diversified in terms of training PhDs for positions in industry. The department also graduated 6 MS degrees, a bit below the five-year average: Ishraq Al-Awamleh, Toai Thanh Luong, Jayasinghage Ruchira Nirmali Perera, Zeinab Rahmanabadi, Maryam Sharifi, and Ziyuan Wang. Al-Awamleh, and Wang are continuing in our PhD program; Sharifi is now a GA in Economics and International Business at NMSU, Luong and Perera are pursuing further studies elsewhere and Rahmanabadi is teaching at a community college in the Dallas area. Just as in 2015–2016, the department graduated 14 Bachelor's degrees: Amanda Bataycan, Stephen Brazil, Ashley Chatterton, Katherine Deaven, Lauren Howard, Rachel Hubly, Maya Kennon, Christian Keyes-Garcia, Brianna Maio, Jacob Moulton, Anika Perez, Justin Strawn, Ruben Tovar, and Susanna Valenzuela. Some of them are pursuing graduate degrees. Data on the number of Math minors in 2016–2017 is not readily available. The five year average for 2011–2016 is 70.8 according to OIA data. As of Fall 2017, cognos lists 69 students declared as undergraduate MATH majors (30 female; 31 Hispanic and 2 Native American), slightly above the recent average, and 37 graduate majors (21 MS and 16 DR; 15 Female; 6 Black or African American; 11 White; 12 Asian, 4 Hispanic and 4 Unknown origin). These numbers are also consistent with recent history.

Progress on Stated Goals

The Department of Mathematical Sciences worked on a self-study for a program review site visit that took place in October 2017. Anticipating the review, goals for 2016–2017 were effectively maintenance goals. The department anticipates more significant five-year goals in response to the external review.

Teaching Goals for 16–17: Have students who successfully complete AS 103 subsequently successfully complete MATH 120 or a Gen-Ed MATH course at a rate comparable or above current pass rate of about 60%. Compare subsequent performance of AS 103 students with students coming through CCDM courses. Maintain or improve completion rates in Gen-Ed MATH courses.

Progress on Teaching Goals for 16–17: *The goal that students passing AS 103 should pass 120 at a comparable rate was barely met. The goal that students should pass Gen-Ed courses at rates comparable to the previous year was not met.*
First, it should be stated that the department's ability to report on these goals, ones that are of interest to the whole undergraduate enterprise at NMSU, relies on its having a very competent and efficient Director of the Math Success Center who took the initiative to set up the course AS 103 (with help from the instructors), and who very effectively manages the variance in quality of instruction and learning measurement across multiple sections of courses up to MATH 190G.

A report on progress in AS 103 was submitted to the Provost in February with a follow-up in July. Of 134 students who registered for AS 103 in Fall 2016, 84 passed (Pass Rate=65%) with a C or better. By comparison, FA16 pass rates for MATH 120 were 54%. 95 took a follow up class in Spring 2017, including 18 repeats, 40 in MATH 120 (19 or 47.5% passed vs 52%

overall), 9 in MATH 121G (only 3 passed), 2 in MATH 192G[1], 25 in MATH 210G (23 passed) and 1 in STAT251G. Failure of AS 103 in Fall almost guaranteed repeat failure in Spring, mostly due to poor of attendance.

Mean percent pass rates in FA16 relative to (FA15, FA14) for MATH 120 and General Education courses were as follows: 120: 54% (56, 52); 121G[2]: 46% (52, 63); 142G: 58% (60, 72); MATH 190G: 57% (60, 63); 191G: 46%[3] (61; 68); 192G: 45% (67, 67); 210G: 85% (82, 87). As usual there was a lot of variation in pass rates over different sections taught by different instructors. (120: 20–70% but mostly 50-60%; 121G 25–72%, mostly 45–55%; 190 47–68%; 191G 17–65% but mostly 45–55%; 192 36–52%; 291 58%-82%).

Research Goals for 16–17: Involve the vast majority (80 to 90 percent) of graduate faculty members in peer-reviewed work either submitted or accepted or performed in a suitable Boyer context in 2016–2017. Maintain current levels of funded activity with the aspiration of having 80-90 percent of tenure-track faculty involved in externally funded work or in seeking funding, with the remaining 10–20% involved in extraordinary service or outreach.

Progress on Research Goals for 16–17: *In the sense of maintaining productivity, the publication goal was met, but not faculty who did not publish were involved in extraordinary service, so in that sense the goal was not met. The goal that 89-90% of tenure-track faculty be involved in externally funded activities was not met.* As mentioned above, the number of departmental research products in 2016–2017 was substantially lower than that reported in 2015–2016, but on par with the average output in recent years. Six faculty members did not list any products published or in press. All but a couple of these six have articles currently or soon to be submitted for publication. A bigger concern is involvement in externally funded projects, particularly ARGIS funding, as only 12 tenure-track faculty members were listed on active (or proposed) ARGIS projects and only 15 were listed on any externally funded project. Several of those individuals not involved in ARGIS funding work extremely hard to maintain and try to improve our programs from top to bottom and the department administration is reluctant to neglect those fundamental aspects of our mission in pursuit of research dollars. Nevertheless, the department as a whole needs to acknowledge that the justification of a reasonable teaching load derives largely from its efforts to support the research endeavor through grants and contracts. As such, part of the departmental research goal for 2017–2018 will be to seek a consensus as to whether ARGIS activity constitutes a necessary condition for a tenure-track faculty member to exceed expectations in research.

Service Activities: Continue to serve the college, university, and profession in ways that reflect the central role of mathematics in promoting quantitative reasoning across curriculum, in promoting quantitative analysis in strategic planning, and in maintaining a strong national reputation.

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[1] The two students evidently were misadvised
[2] Except for one instructor, would have been higher than FA15
[3] One section of MATH 191G had a 17% pass rate in FA16

Service Goals for 16–17: Involve all tenured faculty members in college or university committees, policy bodies or task forces, or in scholarship or public service in support of NMSU's educational mission, or contributing to departmental service in a critical way that furthers the general educational mission of the university.

Progress on Service Goals for 16–17: *Strictly, the departmental service goals were met for 16–17.* All but two tenure-track faculty members reported some sort of editorial review service or professional service with a leadership aspect in 2016–2017 (all but four last year). While every tenure-track faculty member contributed in some way to the service role of the department, one could argue that five or six contributed minimally, meaning they did not contribute to the maintenance or improvement of our programs (departmental or university-wide) in a way that the majority of faculty in the department would regard as benefitting everyone. Thus, while the departmental service goals were met, there is a growing sense among some faculty members that 150-200 hours (10%) of service for the greater good of the department or immediate NMSU community is not a universal standard in the department. As such, part of the service goals for 2017–2018 should be trying to identify ways of measuring real contributions in service to the improvement of NMSU vs to the edification of a small subset of its constituents.

Program Goals for 16–17: Continue to graduate four or five PhDs and about 10 or 12 MS and BS students per year. Make progress on updating information on web pages to make programs more attractive to potential students. Write a comprehensive self-study.

Progress on Program Goals for 16–17: *The goals for overall graduation rates were minimally met.* The department graduated three PhD's in 2016–2017. A few PhD students are ABD, which is unfortunate. Realistically, the department may be looking at an average closer to 3 PhD's per year in the next few years compared to the average of five it produced from 2011–2016. The department graduated 6 MS degrees and 14 BS degrees in 2016–2017, consistent with the 2011–2016 averages of 6.8 MS degrees and 13.8 BS degrees. There are some serious concerns for our BS degree as service requirements continue to shift down. Besides EE dropping its requirement of MATH 291G, the College of Education has dropped MATH 331 and 332 as requirements for an emphasis in Secondary Education. In neither case was Mathematical Sciences informed by the respective programs of these changes, so there was no opportunity for discussion. Regarding the department self-study, this was completed in August.

Progress on Program Review Plan for 16–17: Not Applicable. Awaiting feedback from Review Team.

Goals for 2017/18 Year

The Department of Mathematical Sciences is soon to receive feedback from an external review team that conducted an Academic Program Review site visit in October 2017. Given that the report will address five-year goals for the department, some of which are expected

to require somewhat immediate attention, the departmental goals for Teaching, Research and Service will be formulated largely with regards to its annual processes only.

Teaching Activities: The department plans to continue to run AS 103 in Fall and Spring and to assess student success in this course in terms of readiness for MATH 120 or beyond. The department also plans to look closely at its Graduate Program in 2017–2018 with a view toward efficiencies that will clarify expectations and intended outcomes for students.

Teaching Goals: Have students who complete AS 103 subsequently complete MATH 120 or a Gen-Ed MATH course at a rate comparable to or above current pass rate of about 60%. This goal is retained from 2016–2017. Maintain or improve completion rates in Gen-Ed MATH courses. This goal is retained from 2016–2017. The department will drop the goal of comparing AS 103 and 120 to CCDM 114 in light of proposed changes to DACC curricula. The department will continue to investigate improvements in Math Placement, with a view toward whether a more effective instrument is feasible.

Research Activities: Continue overall publication and other nationally and internationally recognized scholarship at levels consistent with recent years. Discuss long-term objectives for external research funding. External reviewers for the Mathematical Sciences ADPR noted a logical inconsistency in awarding *Exceeds Expectations* ratings to highly productive faculty who are not involved in ARGIS proposals or funding (i.e., directly though NMSU), when departmental criteria state that application for external funding is necessary to *Meet Expectations* for progress toward promotion and tenure. The reviewers suggested that requiring involvement in proposals or funding through NMSU as a necessary condition for EE ratings on research might serve to encourage applications for funding.

Research Goals: Involve the vast majority (80 to 90 percent) of graduate faculty members in peer-reviewed work either submitted or accepted or performed in a suitable Boyer context in 2017–2018. Increase numbers of ARGIS proposals for external research funding relative to 2016–2017.

Service Activities: Continue to serve the college, university, and profession in ways that reflect the central role of mathematics in promoting quantitative reasoning across curriculum, in promoting quantitative analysis in strategic planning, and in maintaining a strong national reputation. Discuss expectations attached to allocations of effort regarding service that enhances NMSU and its programs.

Service Goals: Involve all tenured faculty members in college or university committees, policy bodies or task forces, or in scholarship or public service in support of NMSU's educational mission, or contributing to departmental service in a critical way that furthers the general educational mission of the university. Move toward an expectation of *tangible* enhancement of processes or programs through NMSU service.

Program Activities: Recruit and closely advise new Master's students, encourage timely completion of degrees and maintain a balance in graduate programs with approximately 50% of graduate students in the MS and PhD program. Continue to publicize our major

emphases and to reconsider whether any adjustments to the requirements of the different emphases are needed. Have the Graduate Studies Committee formulate recommendations to the department regarding curricula and policies for MS program with intention to decide whether to implement. Begin to look at revising curricula and policies for undergraduate and PhD programs.

Program Goals: Continue to graduate four or five PhDs and about 10 or 12 MS and BS students per year. Continue to make progress on updating information on web pages to make programs more attractive to potential students. Have department discuss and decide on proposed modifications to the MS program. Begin to incorporate feedback from external review in October into a five-year action plan. NOTE: Program goals will be rolled into the Program Review Plan in future years.