CPAS 2013-14 Mathematics
Note: All Course SLOs have been mapped to Program SLOs.

Fall 2013
Group A Revise and Implement

Course	
021	Revision and Implementation Stages
122	Revision and Implementation Stages
123	Revision and Implementation Stages
124	Revision and Implementation Stages
126A	Revision and Implementation Stages
126B	Revision and Implementation Stages
127	Revision and Implementation Stages

Group B Analyze

Course	Action
229/231	Discussed an analyzed the results at the Fall 2013 Division Retreat. **Summary Analysis:** 108 students took the assessment, of which 81 (75%) reported they were passing. Since the last time 229/231 Assessment we changed the following: 1. *We added one unit to Math 229 to give more time to cover topics.* 2. *It was decided to change the order of Questions #1 and #3, wording on Question #2* 3. *We combined the results from both Math 229 and Math 231 since both courses cover exactly the same trigonometry and have the same SLO's.* It's not clear what affect these changes had on student learning outcomes and performance. Some questions showed improvement and some had lower scores. Of course with different instructors teaching and different students taking the test makes it difficult to compare the results from one semester to another. Following is the analysis of the individual questions. Question 1. 61.11% A slight drop in the success rate for M229, but a significant increase for M231. It appears the strategy of giving the assessment during finals week paid off for the M231 class. Students choosing D simply overlooked the reflection. Maybe there shouldn't be a "None of the above" option. Moving this question to the first position did not seem to increase success. Question 2. 44.44% The revision in wording actually resulted in a decrease in success. Perhaps the "None of the above" option should be removed for this particular question. Students may be stopping too early and not simplifying far enough. Question 3. 35.19% A significant increase for M229 but slight decrease for M231. If additional time is being devoted to this chapter in M229 due to the extra unit, the effort may be paying off. However, the results are still miserably low. The most popular distractor is correct if limiting the solutions to one cycle (0°-180°), so perhaps students are just not reading the instructions carefully enough. Many students are not seeing that there is a period change which increases the number of solutions. Possibly the wording of the multiple choice options confuses students. Question 4. 71.30% This is a marked increase in student success. Yay team! We seem to be happy with this result. Question 5. 81.48% Other than the obvious improvement due to the key correction, this is pretty consistent with the previous assessment (if you average them). We are still doing well with this topic!! We seem to be happy with this result. Question 6. 58.33% Some improvement for M231, but no real change for M229. If additional time is being spent on this topic, it is not effective. A different strategy is called for. Students are still

	struggling with this.
230	Discussed an analyzed the results at the Fall 2013 Division Retreat. **Summary Analysis:** 58 students took the assessment of which 51 reported they were passing. This is a unique class for the math department. Since there is a single instructor for this course, we will make certain that the instructor has seen the results of this assessment. We will also encourage instructors to put additional focus into the logic topics. We will also put the topic of emphasizing logic across all lower division courses as a topic for a "food for thought" meeting. **Q1:** Counting Theory-2013: 68.97% Great improvement from last assessment: 2011: 34.48% **Q2:** Logic 20.69% Students struggle with logic because of so little exposure in the developmental Math courses. This is the most important problem on this assessment. 2011: 31.03% **Q3:** Venn Diagram 2013 55.17% Down somewhat "None of the Above" was a popular choice. 2011: 63.79% **Q4:** Modular Arithmetic 2013: 82.76% Great improvement from last assessment. 2011: 46.55% **Q5:** Probability 2013: 2013 18.97% About 19% knew conditional probability. Another 19% ignored the condition (answer D – great distractor). But the best distractor was answer E (none of the above) which suggests at least 43% had absolutely no clue. 2011: 50.00%
232	Discussed an analyzed the results at the Fall 2013 Division Retreat. **Summary Analysis** Note: 124 students took this assessment of which 88 reported they were passing. Note: In 2011 206 students took the assessment. In Math 232, we are continuing to use the same textbook. However, with the new edition, we have increased communication about specific expectations of the course including a detailed "suggested homework" sheet that incorporates notes about topics. As a result more dialogue has occurred with adjunct faculty. We are continuing to improve communication and welcome all suggestions from faculty involved. Overall assessment: We found that algebraic manipulation skills continue to be very poor in these students. The students did best on questions involving graphical concepts, currently and in the past assessment. We should discuss, as a Division, how to incorporate more graphical reasoning to help students to get over the algebra "hump". We also may need to allow more time on the topic of Zeros of Polynomials since that has been consistently difficult for students, based on the result of the assessment. We are very pleased with how well the students handled the questions regarding modeling real world functions since this is a goal for this terminal, non-STEM students. **Q1** asks students to evaluate a piecewise function. The results indicate that the students have some difficulty still determining what the value of the function is at the changing point. There was some improvement since 2011 (48.06% correct in 2011 to 52.42% in 2013) **Q2** asks students to find a complex zero of polynomial. The students did better though still not well (15% correct in 2011; 29% correct in 2013). This is a very difficult multi-step problem with lots of room for error. Although there was improvement, polynomial functions and their zeros is clearly still a difficult topic for students. In particular, since it is a complex zero, students have no direct graphical support. The Division

	suggested that we need to allow more time for this topic. **Q3** asks students to identify the vertical asymptote of a rational function. The students performed similarly on this question (68.5% correct in 2011; 62.1% correct in 2013). These are good results for this difficult topic Q4 is a new, more difficult question. The 2011 question only had them set up augmented matrix for a given system. The new question asked them to put the system into row reduced echelon form. We deduced that the students were confused about vocabulary. The results from 2011 were that 87.3% were successful in writing an augmented matrix. Only 29% were successful in putting the matrix into the correct reduced row echelon form in this 2013 assessment. It is not surprising that the results are lower than last time considering the increase in difficulty of the question. However, it appears that the vocabulary is not clear to many considering 26.6% chose the initial augmented matrix. Also note, students had access to graphing calculators which could potentially make this an easy problem with knowledge of the vocabulary. Suggestions are that we should make "row reduced echelon form" bold on new test. We could give all answers in RREF to see whether they can solve the system. That way the question is testing whether they can solve a system rather than testing vocabulary. Another suggestion is to leave the answers as they are but have (b) not be the correct REF (change one or both of the rows). Also change one row in (a), i.e., so only one answer is actually correct, if in the wrong format. **Q5** asks the students to match the standard form of the equation of an ellipse with the correct graph. The students did very well and actually improved on this topic, from 73% correct in 2011 to 79% correct in 2013. Recognizing the graph of an equation of a conic section still has strong results. Perhaps visual content is stronger for the liberal arts group? **Q6** asks the students to match a given graph to the correct exponential function, In 2011, 84% of the students answered correctly. In 2013, 85% answered correctly. Once again, great results. This is the type of question we would like humanities majors to feel comfortable with leaving our math courses, relating mathematics to real world information. As in question 5, students seem to excel with visual representations and perhaps that would be a worthy emphasis as much as possible when teaching the course content. In 2011, students who did not take Math 127 and reported that they were passing the class scored the highest on the assessment. 206 students took the assessment with 48 students reporting they were not passing or unsure of their grade. 8 students left the questions blank. In 2013, only 124 students took this assessment, which was given at the end of the semester. This is a reflection of lower enrollment in math 232 than we've had in the past. 29 students reported they were not passing or were unsure and 7 students left it blank. Once again, students who did not take math 127 as the prerequisite performed better, which would be expected since they entered Cuesta College with stronger math skills.
242	Discussed an analyzed the results at the Fall 2013 Division Retreat. **Summary Analysis:** 203 students took the assessment of which 135 said they were passing the course. Students who did not take Math 127 at Cuesta College (self) record the highest passing rate in 242. This matches the result of 2011. The one big change from the last assessment to this one was a new textbook…we should continue to monitor these results carefully. We should discuss role of graphing technology in class. Change SLO that requires the use of a graphing calculator in this course. This course supports courses that do not allow graphing calculators, so maybe the role of graphing technology should not be as prominent. We should have each instructor provide this assessment in a consistent manner. Maybe all instructors should give at the same point in the class (final exam, last day of class). Seems to be a bit of laziness with respect to this assessment from the students, maybe they don't care about the results. Should points be awarded? An indicator of this is the predominance of answer (a) throughout the assessment. Many instructors feel that

	the new book is not to blame for decreased results. Discussion of rewriting the technology outcome will be part of division meeting(s) in Fall 2013. **Q1:** 48.77%, a decrease of 12.73% from 2011. It appears the instructors didn't do enough additional pushing of this concept ☺ Did we push in the wrong direction??? Results went way down, why? New text was adopted since 2011, graphing calculator use is no longer required. Maybe not due to the use of graphing technology since question 2 has consistent results. Recommend that we look into the book not being as effective as we hoped. This could be the graph of some rational function in a viewing rectangle that is not very enlightening, but they should be able to identify this shape. Many students get confused between exponential and logarithmic graphs/functions. **Q2:** 42.86%, a decrease of 0.06% from 2011. The students did about the same as last time. There appears there may be a bit of a disconnect between the concepts and applying them to a real life problem. Or once again connecting the algebraic concept to the graph… The actual max (answer) is at 17.3, so maybe (b) answer of 14.3 should be changed. Many students are choosing (a), is this due to improper viewing rectangle, lack of understanding, or disinterest? Could they answer this question correctly if we provide the graph? Change SLOs for the course. What is more important, graphing on calculator or analyzing a graph? If they are not using a graphing calculator, then what graphing technology are they using? Some use Wolfram Alpha on iPhone. Graph was provided in some classes, results are inconclusive overall. When graph provided, results likely very good, what about other classes? We should provide specific instructions to instructors to present exam in consistent way. Recommend we change outcome. We should give graph and have them analyze. We could broaden outcomes overall. What is the role of technology in this class? **Q3:** 40.89%, a decrease of 6.01% from 2011. We changed the problem so that the denominator is not longer factored. It doesn't appear to have helped the students to have it in this form. **Q4:** 50.25%, a decrease of 12.58% from 2011. The most frequent distractor was none of these…wonder if just guessing… **Q5:** 27.59%, a decrease of 19.31%. The answer that was chosen the most (41.38%) is the one that is a circle instead of an ellipse, but with the correct center. This is the only one where the majority did not choose the correct answer. Seems a little lazy- thinking the first distracter should be written in general form as well…. Maybe answer (a) should be in general form. Given the standard viewing rectangle on a graphing calculator, a circle could look like an ellipse, but it is unclear whether students would know how to graph this equation on their calculators. Due to high number of answers for (c) and (e) (the only two ellipses), perhaps critical thinking skills of students are at a good level (process of elimination). Students are not asked to do this exact type of problem in the course. They are given information about a graph, then write equation (presumably they would have to draw the graph to do this) – but equation is not then put into general form. **Q6:** 44.83%, a decrease of 6.94% from 2011.

Group C Assess

Course	Action
255	Assessment revisions discussed and approved at Fall 2013 SLOs retreat
265A	Assessment revisions discussed and approved at Fall 2013 SLOs retreat
265B	Assessment revisions discussed and approved at Fall 2013 SLOs retreat
283	Assessment revisions discussed at Fall 2013 SLOs retreat and will be brought to a division meeting for final approval
287	Assessment revisions discussed at Fall 2013 SLOs retreat and will be brought to a division meeting for final approval
Program AS	It was decided at the Fall 2013 retreat to use the student Learning Outcomes and assessment tool from Math 283 and 287 as our AS and AS-T program outcomes and assessments since these are the capstone classes for

	the two degrees.
Program AS-T	It was decided at the Fall 2013 retreat to use the student Learning Outcomes and assessment tool from Math 283 and 287 as our AS and AS-T program outcomes and assessments since these are the capstone classes for the two degrees.

Group D Revise and Implement

Course	Action
003	Revision and Implementation Stages
007	Revision and Implementation Stages
008	Revision and Implementation Stages
112	Revision and Implementation Stages
114	Revision and Implementation Stages
236	Revision and Implementation Stages
247	Revision and Implementation Stages

Spring 2014

Group A Revise and Implement

Course	Action
021	Revision and Implementation Stages
122	Revision and Implementation Stages
123	Revision and Implementation Stages
126A	Revision and Implementation Stages
126B	Revision and Implementation Stages
127	Revision and Implementation Stages

Group B Revision and Implementation

Course	Action
229	Revision and Implementation Stages
231	Revision and Implementation Stages
230	Revision and Implementation Stages
232	Revision and Implementation Stages
242	Revision and Implementation Stages

Group C Analyze

Course	
255	These results were analyzed at the Spring Math SLOs Retreat: January 15, 2014 **Q1:** 89.47% correct**.** The students seem to understand how to use the quotient rule effectively for simple application. Maybe change distracter (a) to x, and get rid of another distracter. Also change distracter (d) to num over denominator squared. *The department discussed encouraging Math 255 instructors to emphasize early in the semester that the students who are accepted to University will have their acceptance rescinded if they do not successfully complete Math 255. This emphasis could be one reason that students scored so well on this SLO assessment.* **Q2:** 89.47% correct. Great improvement of 13% over 2011. Could change distracter (a) to 1/9. **Q3:** 92.11% correct. Problem was changed from 2011 not to evaluate at 1. Students clearly understand how to compute a somewhat complicated derivative. However, the difference in results from the previous assessment indicates that students in Math 255 still struggle with some concepts from algebra. Instructors are encouraged to continue to challenge and enhance student's algebra skills throughout Math 255. **Q4:** 78.95% correct. Problem changed from having LCDs in distracters. Improvement of 13% over 2011. Their calculus seems strong, when algebra complications decreased. Improved results again indicated some weakness with algebra skills. Instructors are encouraged to continue to challenge and enhance student's algebra skills throughout Math 255. **Q5:** 89.47% correct. Improvement of 6%, scores were very high. **Q6:** 63.16% correct. Decrease by 9% in correct response. Emphasize precision, and perseverance. Many got correct value for x, but did not substitute in to get correct price. Students could be encouraged to show all their work and get a final solution *before* entering the result in the multiple choice section.
265A	These results were analyzed at the Spring Math SLOs Retreat: January 15, 2014 **Q1**: 48% of students answered this question correctly. Students struggle with limits, confusing a function

	being defined at a point with a limit existing at a point. Instructors will continue to emphasize the difference between a function being continuous at a point and having a limit exist at a point. One interesting note is that the students performed about the same despite our using a new textbook this semester. **Q2**: Students performed surprisingly well on this question, given that they were required to successfully utilize the chain rule and quotient rule. The percent of students who were correct increased from 49% in 2011 to 63% in 2013. Some of this improvement may be due to the new text – the book teaches the derivative of e^{kx} as a rule: $d/dx[e^{kx}] = ke^{kx}$, rather than teaching the derivative as an application of the Chain Rule. One other reason for students' improvement may be that the new text is more algebraically intensive. **Q3**: Students appear to have a basic grasp of how to find inflection points. Students improved from 59% in Fall, 2011 to 69% Fall, 2013. Again, the increased algebraic emphasis of the text may have contributed to the improvement. Recommendation: Change the function so that the y-value of the inflection point is less "awkward." **Q4**: 53% of students answered this question correctly. Students appear to possess a fair comprehension of related rates. Given that this question involves several steps, they seemed to performed well. However, if a student realized that the rate must be negative, he/she had a 33% chance of guessing correctly, and could ascertain the correct response if they realized that both the (correct) negative and corresponding positive answers were solution choices. The other possibility is that students have a reasonably good grasp of related rates. We should continue to emphasize the difference between positive and negative rates of change in the context of related rates Recommendation: Change answer d to 16/6. **Q5**: 57% of students answered this question correctly. Students may have been confused by the word "smallest" in the context of Riemann Sums. They may have understood "left Riemann sum" better because this terminology is used in the text. Recommendation: Include a number smaller than the correct answer "7/4" Q6: 29% of students answered this question correctly. A possible reason is that some students cannot differentiate between $\int_a^b f(x)\,dx$ and $\int_b^a f(x)\,dx$. Either they didn't notice that $\int_2^1 f(x)\,dx$ had "reversed" limits of integration or they did not understand that $\int_2^1 f(x)\,dx = -\int_1^2 f(x)\,dx$ Recommendation: Change the order of the integrals presented in the question so that $\int_2^1 f(x)\,dx$ is listed last.
265B	These results were analyzed at the Spring Math SLOs Retreat: January 15, 2014 **Q1**: The results (86%) showed that students knew how to identify an appropriate integration strategy. The previous assessment cycle was an 89%, so there was a slight decrease in success. The distractor was c, but the only suggestion to modify the question was to possibly get rid of the option of "none of the above". **Q2**: The question was accidentally graded with the wrong answer. The correct answer was C and a result of 74% of the students getting it right. We had a significant increase in success (previous was 37%) by centering the Taylor polynomial at zero. This leads us to believe that we need to spend more time on Taylor polynomials not centered at zero during the course and possibly change the assessment tool "back" to the

	non-centered case. **Q3**: The students were successful (result of 88%) in solving a simple, separable differential equation. It went up from the previous assessment cycle which had a result of 76%. **Q4**: The previous assessment cycle there was a distracting answer that was removed for this tool. This increased our results from a previous score of 34% to 73% for this cycle. This is still a difficult topic for students and we will continue to work on improving their understanding of sequences and series. **Q5**: Students overwhelmingly knew how to find the cross product with a success rate of 88%. The "only" mistake was the sign of the "j" component which accounted for every missed answer. This was an improvement in the previous assessment cycle results of 81%, however this item will not be included on the next 265B assessment cycle since this topic is now being taught in Math 283. **Q6**: The question was accidentally graded with the wrong answer. The correct answer was C and had a result of 90% which was up slightly from the previous cycle results of 89%. However this item will not be included on the next 265B assessment cycle since this topic is now being taught in Math 283. **Q7**: The question was accidentally graded with the wrong answer. The correct answer was C. The results show 54% of the students were able to answer the question correctly which is up from the previous assessment cycle of 43%. We previously thought the low scores may have been due to the topic being at the beginning of the semester and the test was given at the end. We are also wondering whether the difficulty is in setting up the correct integral or evaluating it? Have instructors noticed that this is a topic that is weaker among their students? The topic is tricky for a lot of students and we will need to discuss teaching strategies to encourage success. We are leaving the question as is.
283	These results were analyzed at the Spring Math SLOs Retreat: January 15, 2014. **Q1**: 67 % correct. Emphasize why they want to unitize the direction vector. Results are similar to the previous assessment cycle. **Q2**: 63.5% correct. The students did improve since the last assessment cycle. 76% found the correct normal vector. Option c should be changed to be a distractor (the d component). **Students performed worse on the final exam than during the semester on this topic. They are not putting in the required preparation for the cumulative final exam. Division discussed minimum final exam scores and accountability at this level.* **Q3**: The percent went up to 50%. Noticed that students were using spherical coordinates rather than cylindrical. Emphasize sketches and see what the cross section is. The big distracter was b since that was the answer associated with spherical coordinates. **Q4**: 79% for A and 85% for C. The error in the 2011 assessment was corrected and the correct responses went up from the previous assessment cycle. The number of missing responses from the 2011 assessment cycle emphasizes the need to make this worth points towards their grade. **Q5**: 56% correct. The problem was changed and the success rate did go up. The distracter was primarily ignoring the divergence of 3. Oops. Emphasize multi step process and actually use it to calculate. Continue to emphasize the need to be precise with calculations.
287	These results were analyzed at the Spring Math SLOs Retreat: January 15, 2014 In order to balance the student learning outcomes between differential equations and linear algebra, the two major areas of study in Math 287, it was decided to replace two of the existing SLOs with two new SLOs dealing with linear algebra. The current SLOs for this course are *1.* Determine and apply an appropriate technique to solve a second order linear differential equation. *2.* Solve a system of differential equations using matrix and vector techniques *3.* Set up a model, using differential equation(s) that could be used to solve an applied problem. *4.* Demonstrate an understanding of vector spaces.

	5. Demonstrate an understanding of linear transformations. Historically these SLOs have been assessed by questions appearing on the final exam. This semester there were two sections of the course, one section was assessed using final exam questions the other using an extra credit quiz. This discrepancy in assessment techniques seems to have dramatically changed the measurements of the students' achievement of the learning outcomes for the course. Because of this change it is very difficult to come to any conclusion about the efficacy of the course based on the SLO assessment data. To eliminate this possibility from occurring again we recommend that a single assessment tool, like those used in the other math classes, be developed and used in future assessments. Below are the aggregate student scores on each SLO 1. 60% 2. 44% 3. 45% 4. 45% 5. 49%
Program AS	See Math 283 and 287
Program AS-T	See math 283 and 287

Group D Assess

Course	
003	Assessment revisions discussed and approved at Spring 2014 SLOs retreat.
007	Assessment revisions discussed and will be revised by a Math 007 Subcommittee.
008	Approve assessment tool Spring 2014 SLOs retreat.
114	Approve assessment tool Spring 2014 SLOs retreat.
236	Assessment revisions discussed and revised by a Math 236 Subcommittee.
247	Assessment revisions discussed and revised by a Math 247 Subcommittee.