LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BS, Mathematics

Course # / Title: MATH 212/ Elementary Functions

Faculty name: Hamid Behmard

Date: 6/20/2011

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Mathematical Knowledge
Problem Solving Skills

B) Check the embedded assessment tool(s) used :

X Exam question
□ Essay
□ Oral presentation
□ Thesis
□ Portfolios
□ Practicum / Service Learning
□ Capstone paper / project
□ Other _____

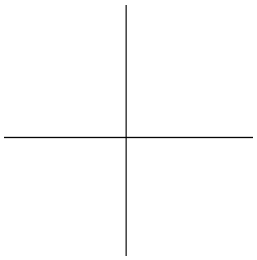
Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Please submit a copy of this action report to your division chair and to the LAS dean's office.

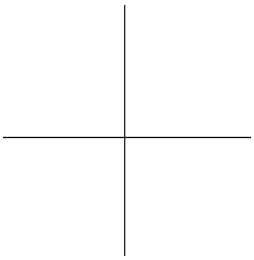
7. $\sin(\alpha) = \frac{-3}{5}$ and $\cos(\alpha) < 0$. $\tan(\beta) = \frac{-1}{3}$ and $\cos(\beta) > 0$.

(2 points)

a. Sketch α in position with a reference triangle; completely label the triangle.



b. Sketch β in position with a reference triangle; completely label the triangle.

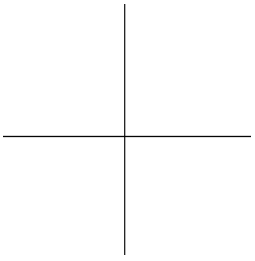


(3 points each) Without using a calculator, find the exact values of each of the following. Show your work for credit. Calculator answers = 0 points.

d. $\cos(\alpha + \beta)$

e. $\sin(\alpha - \beta)$

8. (6 points) Find the three cube roots of $27i$. Show your work for credit. Plot your answers.



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Faculty name: Hamid Behmard

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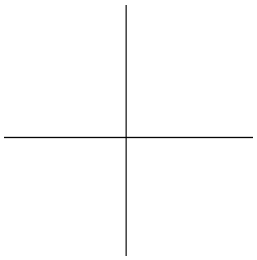
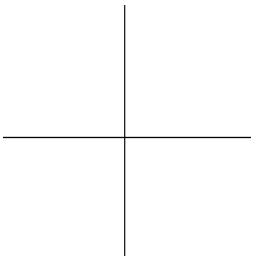


b. Sketch β in position with a reference triangle; completely label the triangle.



(3 points each) Without using a calculator, find the exact values of each of the following. Show your work for credit. Calculator answers = 0 points.

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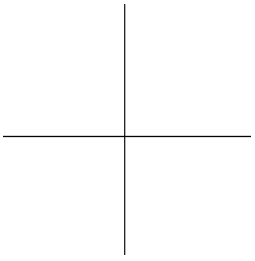


LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BS, Mathematics

Course # / Title: MATH 253/ Sequence & Series

Faculty name: Hamid Behmard

Date: 6/20/2011

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Mathematical Knowledge
Problem Solving Skills

B) Check the embedded assessment tool(s) used :

X Exam question
□ Essay
□ Oral presentation
□ Thesis
□ Portfolios
□ Practicum / Service Learning
□ Capstone paper / project
□ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Please submit a copy of this action report to your division chair and to the LAS dean's office.

(10 pts.) 7. Find the interval of convergence of the given power series. Include a check for convergence at the endpoints of the interval.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-5)^n}{n5^n}$$

(10 pts.) 8. Using definition, find the Maclaurin series $f(x) = e^{-2x}$. Show all your work.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BS, Mathematics

Course # / Title: MATH 254/ Multivariate Calculus

Faculty name: Hamid Behmard

Date: 6/20/2011

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Mathematical Knowledge
Problem Solving Skills

B) Check the embedded assessment tool(s) used :

X Exam question
□ Essay
□ Oral presentation
□ Thesis
□ Portfolios
□ Practicum / Service Learning
□ Capstone paper / project
□ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Please submit a copy of this action report to your division chair and to the LAS dean's office.

MTH254 **Final** **June 6, 2011**
Print your name: **Behmard**

Show your work for each problem in order to receive credit. Allocate your time wisely.

(10 pts.) 1. (a) Find the parametric equations for the line of intersection of the planes $3x + 2y - z = 7,\ x - 4y + 2z = 0$

(5 pts.) (b) Find the angle between the planes.

(5 pts.) (c) At what point (x_0, y_0, z_0) does this line intersect with the xy-plane?

(10 pts.) 2. Differentiate $xz + yz + xy = 0$ implicitly to find the first partial derivatives of z using any method.

LAS
Embedded Assessment Action Report Explanation

Michael Ward, Mathematics

Internally, the Mathematics Department uses a set of eight Extended Learning Outcomes instead of the edited set of three outcomes created for consistency in the Catalog. Our embedded assessment references our Extended Outcomes.

LEARNING OUTCOMES

1. Develop problem solving, modeling and technological skills.
2. Demonstrate ability to make rigorous mathematical arguments, work with axiomatic systems, and precisely articulate (both in writing and orally) complicated and technical arguments (both mathematical and logical).
3. Understand the distinction between applied and theoretical mathematics, the connection between the two fields, and the breadth of each field.

EXTENDED LEARNING OUTCOMES FOR MAJORS AND MINORS

Students will demonstrate:

1. Mathematical Knowledge—demonstrate mastery of a body of mathematics
2. Problem Solving Skills – the ability to analyze complicated problems in a variety of subject areas, and to synthesize solutions to such problems.
3. Modeling Skills – the ability to translate various real-world scenarios into mathematical models.
4. Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.
5. Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Including working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.
6. Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.
7. Subject Awareness – an awareness of the distinction between applied and theoretical mathematics, an appreciation of the connection between the two fields, and a reasonable perception of the breadth of each field.
8. Career Awareness – an awareness of the career and educational opportunities for mathematics majors; this many include internship and undergraduate research experiences.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Mathematics (& some sciences)

Course # / Title: MTH 345 Ring Theory

Faculty name: Michael Ward

Date: 10 June 2011

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(MP) Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Including working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.

(CS) Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.

B) Check the embedded assessment tool(s) used :

☐ Exam question
☐ Essay
X Oral presentation MP, CS
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
X Other "Capstone" homework exercise MK, MP, CS

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

MTH 345 **Mini-projects** **Spring 2011**

These mini-projects are to be presented in class. A rubric for assessment, compliments of S. Beaver, is on the back.

Schedule a meeting with Mike no later than three calendar days before your presentation to show what you plan to do. Through a dress-rehearsal on your own, check the timing of your presentation before the meeting.

At the final exam, each person will draw one of these theorems, other than one s/he presented, to prove.

Topic	Team	Date
Thm. 15.3 First Isomorphism Thm	Keenan, Jason	May 12
2nd and 3rd Isomorphism Thms. = problems 3,4 6e p. 339, 7e p. 341	Andrea, Matt B	May 13
Thms. 14.3 and 14.4	Matt H, Lacey	May 20
Thm. 17.5, Corollaries 1 & 2, Example 10 (& 11 if time) 6e pp. 309 - 312, 7e pp. 311-313	Brittney, Steve, Heather	May 25

Presentation Scoring Guide and Rubric

Score / Evaluation Criteria	4	3	2	1	0	Weight	Possible points
Introduction - Effectiveness of your brief initial discussion of the content, scope, and flow of your presentation	Your introduction makes perfectly clear the salient points and scope of your talk	A bit too brief or missing an important item	Contains some relevant information but not nearly enough	Poorly worded or confusing introduction	No introduction	2	8
Logical Clarity - Your effectiveness in presenting your ideas without (uncorrected) logical flaws	No logical errors	One or two logical errors	Three logical errors	Four logical errors	Five or more logical errors	3	12
Subject Knowledge - Your ability to handle questions	You answer 90% or more of the questions fully and with appropriate elaboration	Your answer to 70%-90% of the questions was sufficient	Your answer to 40%-69% of the questions was sufficient	Your answer to 10%-39% of the questions was sufficient	Your answer to less than 10% of the questions was sufficient	4	16
Temporal Organization - To what degree your talk proceeded without jumping around between ideas, or filling in a detail which should have been provided earlier	All ideas presented in a logical, clear sequence	One unanticipated jump between ideas or filled-in missing detail	Two or three unanticipated jumps between ideas or filled-in missing details	Four or five unanticipated jumps between ideas or filled-in missing details	Six or more unanticipated jumps between ideas or filled-in missing details	3	12
Spatial Organization - Your blackboard technique and neatness; note that slides minimize your chances of scoring poorly here	Excellent use of space, obvious boundaries between ideas, clear and legible handwriting	One or two instances of cramming, poor handwriting, or unclear boundaries	Three or four instances of cramming, poor handwriting, or unclear boundaries	Five instances of cramming, poor handwriting, or unclear boundaries	More than five instances of cramming, poor handwriting, or unclear boundaries	3	12
Relative Pace - The appropriateness of the pace of your talk for yor audience	Ideal pace for the class, you pause when appropriate	Infrequent inappropriate pace, but you still check your audience frequently for apparent grasp	Several instances of inappropriate pace, but you still check your audience several times	Only a few instances of appropriate pace	Consistently too fast or too slow	2	8
Delivery / Eye Contact - How well you interacted with your audience	You speak to the audience, you almost never check your notes, and you spoke clearly	Good eye contact, but you return to your notes occasionally, or occasionally speak too quietly	Fair eye contact with your audience, but frequently return to your notes or speak too quietly	You are usually reading from your notes or speaking too quietly	No eye contact to speak of, or you're presentation was very difficult to hear	3	12
Mechanics - Spelling, grammar, punctuation, etc	No errors	One or two errors	Three or four errors	Four or five errors	More than five errors	1	4
Creativity / Paraphrasing - The degree to which your talk was presented in your own style	Obviously you owned the presentation	Well-paraphrased with a few unnecessary exceptions	Some creativity, but you seem quite bound to the source material	Little creativity or paraphrasing	Presentation recited from the source material	2	8
Graphics - The relevance and clarity of your graphics (if you used, or should have used, any)	Graphics are clear, presented at appropriate times, and each reinforces or explains an idea in your talk	Good graphics, but some room for improvement in clarity, neatness, or relevance	Significant room for improvement	Poorly presented or some missing graphics	Confusing graphics, or no graphics when there should have been	2	8
						25	100

RESULTS: 6/8 students fully met the outcomes MP and CS by scoring 87% or higher; 2/8 partially met the outcomes by scoring 78%.

MTH345 **Chapter 16** **Revised: Spring 2010**

Collaboration Ban in effect for items 3 and 5. Collaboration allowed on the other items.

1. Study the theorems in this chapter.
2. Computations: 6e problems 2, 11, 30; 7e problems 2, 11, 32

   Problem 2 may be rephrased as "In $\mathbb{Z}_3[x]$, show $\widehat{x^4+x} = \widehat{x^2+x}$."
3. Theory:
   (a) 6e problems 7, 17, 19, 20; 7e problems 7, 17, 20, 21
   (b) Give a counterexample to the Degree Rule when the hypothesis that D is an integral domain is dropped.
4. (a) Assume K is a field and F is a subfield of K. Further assume that σ is an automorphism of K with the property that $\sigma(r) = r$ for every $r \in F$. Prove for every $f(x) \in F[x](\subseteq K[x])$, if $z \in K$ is a zero/root of $f(x)$, then $\sigma(z)$ is also a zero/root of $f(x)$.
   (b) Using Chapter 6, 6e problem 23, 7e problem 25 (proved last term), prove the "well-known" theorem that for every $g(x) \in \mathbb{R}[x]$, if $a + bi$ with $a, b \in \mathbb{R}$ is a zero/root of $g(x)$, then $a - bi$ is also a zero/root of $g(x)$.
5. Use the First Isomorphism Theorem to prove
   - $\mathbb{R}[x]/\langle x^2+1\rangle$ is isomorphic to $\mathbb{C}$, if the last digit of your V-number is even.
   - $\mathbb{Q}[x]/\langle x^2-2\rangle$ is isomorphic to $\mathbb{Q}[\sqrt{2}]$ (i.e. 6e problem 40; 7e problem 42), if the last digit of your V-number is odd.

Assessment notes: Problems 3 and 5 quite thoroughly address (extended) learning outcome MK, MP, CS.

Scoring Guide

6	enhanced and correct
5	thoroughly developed and correct
4	complete and correct (with perhaps a very small error)
3	partially complete or partially effective or partially right
2	underdeveloped, sketchy or wrong
1	ineffective, minimal or wrong
0	missing

Resist the temptation to translate those numbers into grades! 3 does not mean C. It means what it says, nothing more nor less.

RESULTS: Problem 5 6/7 partially met the outcomes by scoring 3; 1/8 did not do the assignment

Problem 3 #7 5/7 fully met outcomes MK, MP, CS by scoring 4 or 5; 1/7 partially met the outcomes by scoring 3; 1/7 did not do the assignment. #17 2/7 fully met the outcomes; 1/7 partially met; 3/7 did not; 1/7 did not do the assignment. #19 & 21 (or 20 & 21). 2/7 fully met; 2/7 partially met; 2/7 not met; 1/7 did not do the assignment.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Mathematics

Course # / Title: MTH 252 Calculus I

Faculty name: Michael Ward

Date: 10 June 2011

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(TS) Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.

(CS) Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.

B) Check the embedded assessment tool(s) used :

X Exam questions	MK, TS
X Essay	MK, CS
☐ Oral presentation	
☐ Thesis	
☐ Portfolios	
☐ Practicum / Service Learning	
☐ Capstone paper / project	
☐ Other _____	

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

15. Here is the error bound theorem for the Midpoint Rule: Suppose that $|f''(x)| \leq K$ for $a \leq x \leq b$. Then the absolute value of the difference between $\int_a^b f(x)\,dx$ and the Midpoint Rule approximation using n subdivisions is at most $\dfrac{K(b-a)^3}{24n^2}$.

Consider estimating $\displaystyle\int_2^{52} \sqrt{1+\cos^2(x)}\,dx$ using the Midpoint Rule.

(a) *(3 pts.)* Use Maple (or a calculator) to calculate and graph $|f''(x)|$ over the appropriate interval for the relevant function f. Raise your hand to have this part graded at the monitor *before doing the rest of the problem.*

(b) *(2 pts.)* What is a value of K?

(c) *(3 pts.)* How large do we have to choose n so that the Midpoint Rule approximation is accurate within 0.005? NO WORK = NO CREDIT.

(d) *(3 pts.)* Use your value of n and Maple to give the Midpoint Rule Approximation accurate to within 0.005.

RESULTS: 6/11 fully met outcomes MK, TS by scoring at least 80%; 1/11 partially met the outcomes by scoring 70-79%; 4/11 did not meet the outcome.

FINAL EXAM RESULTS: Every problem (with the exception of a couple of small bonus problems) on the final exam measured outcome MK. 4/11 fully met outcome MK by scoring at lest 80%; 2/11 partially met the outcome by scoring 70-79%; 3/11 did not meet the outcomes; 2/11 did not take the final.

MTH 252 **Finale: Concepts & Short Answer** **Spring 2011**

Answers are graded on correctness and clarity. Direct your answers to a "clueless" classmate.

YOU MAY NOT USE A CALCULATOR NOR YOUR 3" × 5" card WHILE YOU HAVE THIS PART OF THE EXAM IN YOUR POSSESSION.

Name: Write your name on the back only, please.

1. *(3 pts.)* The indefinite integral $\int g(t)\,dt$ is defined to be ...

2. *(3 pts.)* The definite integral $\int_c^d g(t)\,dt$ is defined to be ...

3. *(2 pts.)* Circle two words so that the result is a true statement:
   Suppose that f and g are continuous with $f(x) \geq g(x) \geq 0$ for $x \geq a$.
   If $\int_a^\infty f(x)\,dx$ is CONVERGENT / DIVERGENT,
   then $\int_a^\infty g(x)\,dx$ is CONVERGENT / DIVERGENT.

4. *(4 pts.)* Complete the statements of the two parts of the Fundamental Theorem of Calculus.

   Part 1. Suppose f is continuous on $[a, b]$.

   If we define $g(x) :=$ _____ for each x in $[a, b]$, then $g'(x) =$ _____.

   Part 2. Suppose F' is continuous on $[a, b]$, then $\int_a^b F'(t)\,dt =$ _____.

5. *(3 pts.)* Express $\lim_{\Delta x \to 0} (x_1^* e^{2x_1^*}\Delta x + x_2^* e^{2x_2^*}\Delta x + x_3^* e^{2x_3^*}\Delta x + \cdots + x_n^* e^{2x_n^*}\Delta x)$ as an integral. The x_i^*'s are sample points chosen from a subdivision of the interval $[2, 52]$ into n subintervals of equal width Δx. Do not simplify or evaluate the integral.

6. *(6 pts.=4&2)* Suppose a bacteria population changes at a rate of $r(t)$ bacteria per hour.

   (a) What are the units and practical meaning of $\int_0^3 r(t)\,dt$

   Units:

   Practical meaning:

   (b) Assume there are initially 10000 bacteria. Write a formula for the number of bacteria after 3 hours.

7. *(6 pts.)* For each of the following functions, show whether or not it is a solution to the differential equation $y' + 2y = 2e^x$? NO WORK or INADEQUATE WORK = NO CREDIT.

   (a) $y = \frac{2}{3}e^x$

   (b) $y = \frac{2}{3}e^{-2x}$

8. *(2 free pts.)* Write your own non-obscene calculus obscenity (or not).

   Name: _____

All work and all answers go in the blank space provided (continue on the blank paper provided if necessary). Show all your work neatly. On problems where work is expected, NO WORK = LITTLE OR NO CREDIT. The style of your presentation is a factor in grading. Particularly good solutions may receive extra credit "Quality Points." Choosing more difficult options may also earn extra credit.

Name: Write your name on the back of the last sheet only, please.

9. *(3 pts.)* Style points. To earn these points, be neat, be clear, use proper notation (e.g. not using $\rightarrow$ when you mean $=$; proper notation in integrals), give exact answers whenever possible (e.g. $\sqrt{2}$ not 1.41421), and use overall good style in solving the following problems.

10. (12 pts. = 6&6)

(a) $\displaystyle\int_0^\infty te^{-t^2}\,dt$

(b) Find the exact average value of $h(x) = x\sin(x)$ over $[0, \pi/2]$.

11. Consider the (finite) region bounded by $y = x^2$ and $y = 3x$. Call it R.

(a) *(4 pts.)* Write an integral that gives the area of R. *Do not simplify or evaluate it.* For full credit, include relevant labeled sketches.

(b) *(6 pts.)* Write and evaluate an integral that gives the length of the bottom edge of R. *Do* evaluate it.

(c) *(4 pts.)* Write an integral that gives the volume of the solid of revolution obtained by rotating R around the line $y = -2$. *Do not simplify or evaluate it.* For full credit, include relevant labeled sketches.

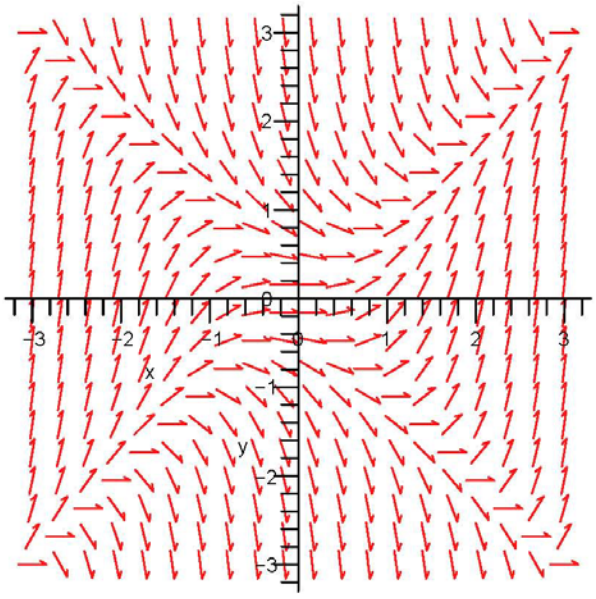
12. *(10 pts. = 6&4)*

(a) Find the (complete) partial fraction decomposition of $\dfrac{3x}{x^2-3x+2}$

(b) Find $\displaystyle\int \frac{3x}{x^2-3x+2}\,dx$.

13. *(8 pts. = 2&2&4)* The slope field (AKA direction field) for $y' = x^2 - y^2$ is shown. Consider the solution to the initial value problem $y' = x^2 - y^2$, $y(0) = 1$

(a) Sketch the solution to that initial value problem.



(b) Estimate $y(0.2)$ from your graph.

(c) Use Euler's method with step size 0.1 to complete the following table. Show your work.

x	y	
0		
0.1		
0.2		

14. *(6 pts.)* Work both parts of *one and only one* of the following two problems, your choice. Continue your work on the next page if necessary.

- Consider a (asymmetrical) prism-shaped tank that is 6 m long and has ends which are right triangles with 2 m and 2.5 m legs (i.e. the sides adjacent to the right angle). The tank is laying horizontally with the 2 m legs of the right triangles on the ground sort of like this $\angle$.

  Imagine the tank is filled with a compressible substance whose density is given by $100 - 20h$ kg/m^3 where h is the distance from the bottom of the tank.

  REQUIRED FOR FULL CREDIT: plenty of labeled pictures, explanations or annotations, and the *location of the coordinate system.*

  (a) Write the integral that would give the mass of the substance in the tank. *Do not simplify or evaluate it.* Include the units.

  (b) Now imagine the same tank is filled with water (weight 9800 N/m^3) and write an integral that would give the work required to pump the water to the top of the tank. *Do not simplify or evaluate it.* Include the units.

- A tank contains 100 L of pure water. Brine that contains 0.15 kg of salt per liter enters the tank at a rate of 10 L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate as the brine enters. Let B be the number of kg of salt in the tank after t minutes.

  (a) Write a differential equation and an initial condition satisfied by B.
  (In other words, complete $\frac{dB}{dt} = \ldots$ with initial condition $B(0) = \ldots$)

  (b) Solve that differential equation.

15. *(6 pts.)* Solve the differential equation $\dfrac{dS}{dt} = \dfrac{S^2}{\sqrt{t}}$ subject to the initial condition $S(0) = 3$.

(2 extra credit points) Best wishes to you. I have enjoyed working with you this quarter.

Name: _____

1. *(7 pts. = 2|2|3)* Consider the cot (cotangent) function over the interval $[-1, 3]$.

   (a) The integral $\int_{-1}^{3} \cot(x)\, dx$ is PROPER or IMPROPER (circle one). Explain your answer.

   (b) Use Maple to complete the following table of values of right (Riemann) sums of cot over the interval $[-1, 3]$. Round each entry to *four* decimal places.

number of subdivisions	value of right sum
35	
75	
155	
445	
647	
1225	
1227	

   (c) Based on the trend in the table, what is your estimate for $\int_{-1}^{3} \cot(x)\, dx$?

2. When you complete this problem, raise your hand. It will be graded at the monitor.

   Consider the solid formed by rotating the region bounded by $y = 8 - x^2$ and $y = x^2$ about the line $y = -2$.

   (a) Use Maple to draw the solid and find the volume. Rotate the solid to give a nice view.

   Score: _____/6 pts. (3 pts. for the drawing; 3 pts. for the volume)

   (b) Show an animation of a slice moving through the solid.

   Score: _____/2 pts.

3. *(2 pts.)* Circle your current opinion. Online homework in this class helps me learn math better than I would have learned it by just doing written homework.

   STRONGLY AGREE AGREE NOT SURE DISAGREE STRONGLY DISAGREE

MTH 252 **Essay for Second Exam** **Spring 2011**

Essay Due: Friday, 20 May 2011, 2PM.

1. One of the following topics will be assigned to you at random.

   - Explain why the volume of a solid is the definite integral of the cross-sectional area function.
   - Explain why arc length of the graph of g is the integral of $\sqrt{(g'(x))^2 + 1}$.
   - Explain why the mass of a solid is the integral of the density function times an *appropriately chosen* cross-sectional area function. Include an explanation of what "appropriately chosen" means.

2. Write an essay on your topic directed to someone who knows what a Riemann sum is and who knows that a definite integral is the limit of a Riemann sum. You may also assume the person has had Calc. I. This is not to be directed to someone, like the professor, who already knows the material and wants you to write a few lines to indicate you know vaguely what is going on. Imagine you are writing a textbook. Use your own words. Do not plagiarize from lecture, the text, or any other source.

3. The essay should use the overall theme of Chapter 6, which is

   - approximate the desired quantity with a Riemann sum;
   - argue that the limit as widths approach zero (or number of subdivisions approaches infinity) of the Riemann sums should give the exact answer; and
   - conclude that the exact answer is a definite integral.

4. Essay checklist. Missing items = lower score.

   - ☐ Essay is directed at the specified audience. (See 2.)
   - ☐ The writing is low-context. That means it is not directed to someone, like the professor, who already knows the material and wants you to write a few lines to indicate you know approximately what is going on. Imagine you are writing a textbook.
   - ☐ The emphasis should be on *why* things are as they are and not just *what* they are or what to do.
   - ☐ Each topic involves an approximation and then arguing that a limit gives the exact answer. (See 3.)
   - ☐ The essay includes informative graphs.
   - ☐ Essay includes an example or sample problem along with a general discussion.
   - ☐ Proper grammar, spelling, sentence structure, paragraphing are used.
   - ☐ Essay is in your own words and style, not those from the text or from lecture or from the web.
   - ☐ Attach this sheet to your essay.

5. You are encouraged to bring a draft of your essay to an office hour for feedback. Experience shows that a complete and correct essay is unlikely without consultation.

6. Since this is part of a test, you may only use your notes and the text. You may not consult any other source, human or electronic. Violation is an act of academic dishonesty and makes the violator subject to appropriate penalties.

7. I hesitate to say anything about length, but 1 - 2 pages should be enough.

8. The essay may be typed, handwritten (very legibly!), or a combination of the two.

The score will be based on the following guide. Ten points are possible on this essay. (This point value is subject to change after I write the exam.) In any case, it is worth a significant number of points.

12	enhanced and correct (2 bonus "quality points")
10	thoroughly developed and correct
8	complete and correct (with perhaps a very small error)
6	partially complete or partially effective or partially right
4	underdeveloped, sketchy or wrong
2	ineffective, minimal or wrong
0	missing

RESULTS: 3/11 fully met outcomes MK, CS by scoring 8-10; 3/11 partially met the outcomes by scoring 6-7; 3/11 did not meet the outcomes; 2/11 did not write the essay.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Mathematics (& some sciences)

Course # / Title: MTH 358 Mathematical Modeling

Faculty name: Klay Kruczek

Date: 4 July 2011

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(PS) Problem Solving Skills – the ability to analyze complicated problems in a variety of subject areas, and to synthesize solutions to such problems.

(MS) Modeling Skills – the ability to translate various real-world scenarios into mathematical models.

(TS)Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.

B) Check the embedded assessment tool(s) used :

X Exam question MK, PS, MS, TS
☐ Essay
☐Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐Other

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Take Home Exam 2

1. Fruit Loops is giving away one of 5 Pirates of the Caribbean toys in each box. I would like to collect 2 Jack Sparrow action figures and one of each of the other four toys. If each toy is equally likely to be in each box, design a simulation to approximate the expected number of boxes of Fruit Loops I need to buy to gather all 6 toys I want (2 Jack Sparrow, 1 Black Pearl, 1 Elizabeth Swan, 1 Will Turner, and 1 Barbossa). (This means you'll need to use Excel to approximate the expected number of boxes of Fruit Loops I need to buy to gather all 6 toys.)

   RESULTS: 15/18 students fully met the outcomes by scoring 80% or higher; 1/18 partially met the outcomes by scoring 70 – 79%

2. Suppose you have a tank that contains 30 gallons of a solution composed of 95% water and 5% Kool-Aid mix. This solution is too weak for you. A second solution containing 75% water and 25% Kool-Aid is added to the tank at the rate of 5 gallons per hour, while at the same time, the entire solution is being drained from the tank (by people drinking it) at the rate of 8 gallons per hour. Assuming the tank is continuously stirred, we want to know the amount of Kool-Aid in the tank over time.

   a. If K(t) is the amount of Kool-Aid at time t, find a differential equation that models this situation.
   b. Use Excel and Euler's method (with h = 0:25) to approximate K(t) over the appropriate time interval.
   c. Approximate the percentage of Kool-Aid in the tank right before the tank is empty.

   RESULTS: 13/18 students fully met the outcomes by scoring 80% or higher; 3/18 partially met the outcomes by scoring 70 – 79%

Final Exam

3. Use the Simplex Method to solve the following Linear Programming problem.

Maximize $z = 3x_1 + x_2 + 4x_3$

Subject to $2x_1 + x_2 + x_3 \leq 2$

$x_1 + 2x_2 + 3x_3 \leq 5$

$2x_1 + 2x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

RESULTS: 10/18 students fully met the outcomes by scoring 80% or higher; 4/18 partially met the outcomes by scoring 70 – 79%

4. Consider the set of data below (with standard deviation $\sigma = 10{:}5$) generated from a random variable X:
   a. Determine the mean of the data.
   b. Generate a relative frequency histogram, using the six bins
      [0; 8); [8; 16); [16; 24); [24; 32); [32; 40); [40; 48)
   c. Determine the distribution of the data (normal, exponential, or uniform).
   d. Find a guess for the probability density function.

10.22	6.39	5.10	3.63	15.33	20.50	10.00
3.14	13.52	11.89	3.76	2.62	0.63	18.22
5.77	38.61	5.43	4.03	2.65	43.39	2.35
11.25	13.08	4.99	12.55			

RESULTS: 13/18 students fully met the outcomes by scoring 80% or higher; 2/18 partially met the outcomes by scoring 70 – 79%.

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Education

Course # / Title: MTH 495 Calculus for Middle School Teachers

Faculty name: Klay Kruczek

Date: 4 July 2011

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

1. Problem Solving - the ability to understand complicated situations, which are applications of K-8 mathematical topics and to apply learned skills and techniques to resolve them.
2. Ability to Model Problems - the ability to translate various real-world scenarios into mathematical models that can be explored by hands-on models, paper-and-pencil methods and technological applications where appropriate.
3. Communication Skills - Ability to precisely articulate (both in writing and orally) K - 8 mathematical topics in a way that is clear and understandable to elementary and middle school students.

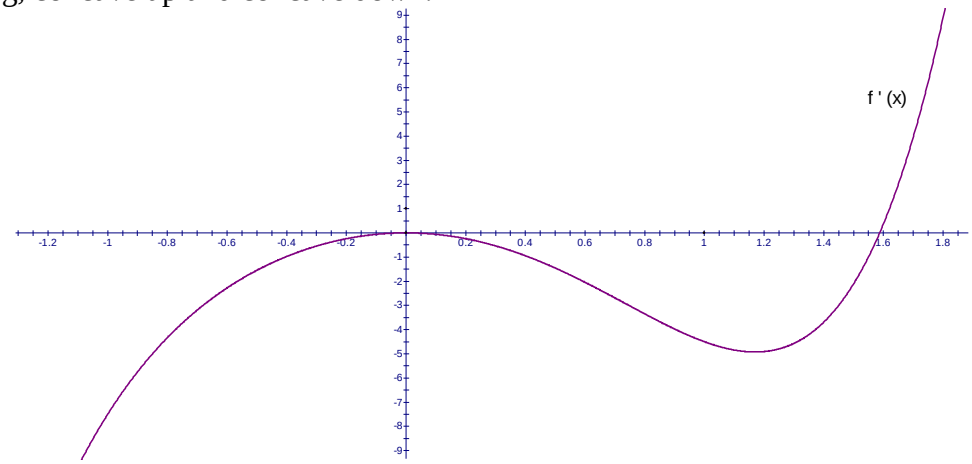
B) Check the embedded assessment tool(s) used :

X Exam question
☐ Essay
☐Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐Other

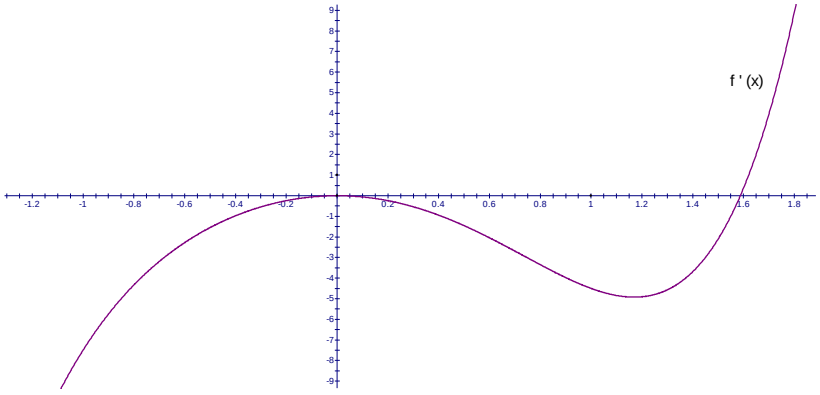
Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Selected questions from the final exam for MTH 495.

1. Graphing (5 points each)
   a. This is $f'(x)$, given that $f(0)=2$, sketch a clear graph of $f(x)$. Mark where $f(x)$ is increasing, decreasing, concave up and concave down.



   b. This is $f'(x)$, sketch a clear graph of $f''(x)$.



RESULTS: 9/13 fully met outcomes by scoring at least 80%; 2/13 partially met the outcomes by scoring 70-79%

2. Suppose you wish to construct a rectangular box made of metal. The base is square, there is no top, and the volume of the container must be 72 cubic meters. Suppose the material for the sides costs \$3 per square meter, and the material for base costs \$2 per square meter. Let x be the length of a side of the square base (in meters).
    a. What is the domain and range of the cost function?
    b. Use calculus to find the least cost container, show your work for setting up your function, check your cost is the least cost using the second derivative (explain) and give a sketch with labeled dimensions and cost of the least cost box.

RESULTS: 6/13 fully met outcomes by scoring at least 80%; 3/13 partially met the outcomes by scoring 70-79%

(5 points each) A bug, located at (0, 1) starts scurrying away from the origin of a large set of axes painted on a patio. The function $v(t) = t^3 + 3t + 5$ inches/minute, describes the velocity of a bug at t minutes. Include units throughout your answers.

a. Find the distance from the origin the bug traveled from $t = 2$ to $t = 6$ minutes.
b. What is the acceleration of the bug at $t = 2$ minutes?
c. What is the distance traveled function (from the origin) for the bug?
d. Describe the bug's behavior; is the bug walking back and forth or always moving away from the origin? Is the bug speeding up, slowing down or …?

RESULTS: 8/13 fully met outcomes by scoring at least 80%

LAS Embedded Assessment Action Report For *Program Review*

Degree Program(s): Mathematics Support for EC/ELEM, ELEM/MS Education majors

(**BA, BS,** BFA, MA, MS, LACC, etc.)

Course # / Title: Math 213 / Mathematics for Elementary Teachers III

Faculty name: Mathematics: Burton & Wiebe

Date: June 4, 2011

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Students will demonstrate:
(PS) Problem Solving Writing Skills - the ability to create and understand complicated situations, which are applications of K-8 mathematical topics and to apply learned skills and techniques to resolve them.

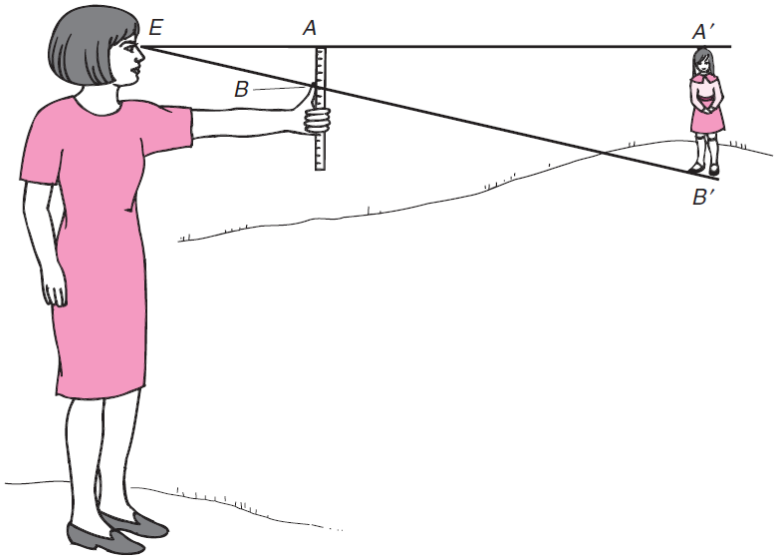
B) Check the embedded assessment tool(s) used :

X Exam questions MK, TS, CS
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Please submit a copy of this action report to the LAS dean's office.

Mary sees a girl at a distance and estimates the height of the girl to be 3 feet. She holds a ruler up and measures length AB to be 4 inches and length EA to be 12 inches. How far away is the girl?



	Total	#	PS	Score (S)		#	PS	Score (S)		#	PS	Score (S)
3 sections												
LB	9*	4	Fully met	$S \geq 80\%$		0	Partial	$70\% \leq S \leq 79\%$		5	Not met	$S < 70\%$
TW combined; two sections												
RW2	36**	26	Fully met	$S \geq 80\%$		0	Partial	$70\% \leq S \leq 79\%$		10	Not met	$S < 70\%$

*2 of 11 students were excused from the final exam with an overall course grade of over 95% prefinal

**7 of 46 students were excused from the final exam with an overall course grade of over 95% prefinal

1 had an alternate, early exam
1 was given an incomplete

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): BA/BS Mathematics

Course # / Title: MTH 251 Calculus I

Faculty name: Laurie Burton

Date: June 4, 2011

A) State the program **(extended) learning outcome** or **general education goal** this assessment is linked to:

(MK) Mathematical Knowledge – demonstrate mastery of a body of mathematics

(TS) Technological Skills – the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.

(CS) Communication Skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.

B) Check the embedded assessment tool(s) used :

X Exam questions MK, TS, CS
☐ Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other _____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

1. Draw a possible graph of a function, *g(x)*, given the following information.
   - $g(x)$ is continuous $0 \le x \le 7$
   - $g'(x) < 0$ when $0 < x < 1$ and when $4 < x < 7$
   - $g'(x) = -1$ when $5 < x < 7$
   - $g''(x) < 0$ when $0 < x < 2$ and when $3 < x < 5$
   - *g(x)* has a critical point at $x = 2$
   - $g'(x) > 0$ when $1 < x < 4$
   - *g(x)* is not differentiable at $x = 1$
   - $g''(x) > 0$ when $2 < x < 3$

Total	#	MK/CS	Score (S)
19	9	Fully met	$S \ge 80\%$

#	MK/CS	Score (S)
7	Partial	$70\% \le S \le 79\%$

#	MK/CS	Score (S)
3	Not met	$S < 70\%$

2. Consider $h(x) = e^{-x^3}$ when $-2 \le x \le 4$
   a. Determine $h'(x)$
   b. Use calculus to determine any critical numbers.
   c. Use calculus to determine wh ere $h(x)$ is increasing or decreasing.
   d. Use calculus to explain if $h(x)$ has any local or absolute maximums or minimums.
   e. Determine $h''(x)$
   f. Use calculus to determine where $h(x)$ is concave up or concave down.
   g. Use calculus to explain where $h(x)$ has any inflection points.
   h. Does $h(x)$ have any vertical or horizontal asymptotes? If so, what are they?
   i. Sketch an extremely accurate snapshot of $h(x)$ from $-2 \le x \le 4$

Total	#	MK/TS	Score (S)
19	5	Fully met	$S \ge 80\%$

#	MK/TS	Score (S)
3	Partial	$70\% \le S \le 79\%$

#	MK/TS	Score (S)
11	Not met	$S < 70\%$

3. Work **one** of the following problems, your choice. Draw a single line through the problem you are NOT doing.

Option 1: Open top box	**Option 2: Inscribed rectangle**
A box with an open top is to be constructed from a square piece of cardboard, with edge length 3 feet, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume for such a box.	Find the area of the largest rectangle that can be inscribed in the circle of radius 2 that is centered at the origin (the circle equation is $x^2 + y^2 = 4$).

   a. What quantity is to be optimized? (give answer as a brief descriptive sentence / don't give an equation here)
   b. Make a sketch and label it by assigning variables to the quantities which change. Don't give an equation here
   c. Derive a formula for the function to be optimized. Eliminate all but one variable.
   d. Give a plausible domain for the function to be optimized.
   e. Use calculus to do the analysis to solve the problem. Show your work in such a way as to make the method, the logic, and the answer perfectly clear.

Total	#	MK/CS	Score (S)
19	6	Fully met	$S \ge 80\%$

#	MK/CS	Score (S)
2	Partial	$70\% \le S \le 79\%$

#	MK/CS	Score (S)
11	Not met	$S < 70\%$

LAS Embedded Assessment Action Report For *Program Review*

Degree Program(s): Mathematics Support for EC/ELEM, ELEM/MS Education majors

(**BA, BS,** BFA, MA, MS, LACC, etc.)

Course # / Title: Math 394 / Geometery for Elementary Teachers

Faculty name: Mathematics: Burton

Date: June 4, 2011

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

Student in this class will demonstrate facility of working with and communicating clearly about: polygons, circles, polyhedra and their properties

- ✓ measurement
- ✓ perimeter, circumference, area, angles, surface area and volume
- ✓ the Pythagorean Theorem
- ✓ triangle congruence & similarity
- ✓ basic geometric constructions

B) Check the embedded assessment tool(s) used :

☐Exam questions ☐Essay
☐ Oral presentation
☐ Thesis
☐ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
☐ Other **Classroom activities**

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.

Please submit a copy of this action report to the LAS dean's office.

Making Scaled Down Boxes

1. Precisely measure the edges of your original box (in cm) and record the length, width and height of your box on the *Box Measurements* table.
2. Fill out the length, width, height, volume and surface area measurements on the *Box Measurements* table.
3. Use carefully measured butcher paper to construct nets for the three scaled down boxes per the measurements on the *Box Measurements* table. Use protractors and rulers to make sure you get your edges straight.
4. Cut out, fold and tape one set of scaled down boxes per group. Label the boxes before you fold and tape them.

Outcomes

- ✓ **measurement**
- ✓ **basic geometric constructions**

Total	**#**		**Score (S)**
16	15	Fully met	$S \geq 80\%$

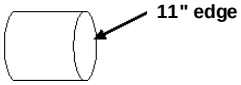
#		**Score (S)**
0	Partial	$70\% \leq S \leq 79\%$

#		**Score (S)**
1	Not met	$S < 70\%$
Did not do task		

Cylinders and Prisms

I. Make the Models

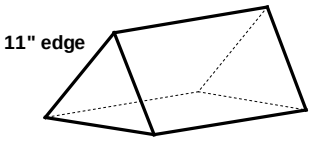
1. **TALL CYLINDER**
   a. Curl a sheet of paper and tape it into the face of **a cylinder** (don't overlap the edges)**.** Curl the 11" edge.



   b. Carefully measure and sketch two circles with circumference 11 inches each. Cut the circles (top and bottom base of the cylinder) out. Show your computational work.

2. **SHORT CYLINDER**
   a. Precisely fold and then cut a sheet of paper in half; the fold should be perpendicular to 11" side. Tape the two pieces together into a 5.5" × 17" rectangle and tape the rectangle into the face of **a cylinder** (don't overlap the edges)**.**
   b. Carefully measure and sketch the two bases of this cylinder. The circumference of the circular bases should be 17 inches. Cut the circles (top and bottom base of the cylinder) out. Show your computational work.

3. EQUILATERAL TRIANGULAR PRISM
   a. Fold a sheet of paper into **three** identical rectangles; the fold lines should be perpendicular to the 11" side. Tape the paper into the shape of an equilateral triangular prism.



b. Carefully measure and sketch the two parallel bases of this prism. The perimeter of each base should be 11 inches. Cut the bases out. Show your computational work.

4. **SQUARE PRISM**
   a. Using the same procedure, fold a sheet of paper into **four** identical rectangles; the fold lines should be perpendicular to the 11" side. Tape the paper into the shape of a square prism.
   b. Carefully measure and sketch the two bases of this prism. The perimeter of each base should be 11 inches. Cut the bases out. Show your computational work.

5. **PENTAGONAL PRISM**
   a. Using the same procedure, fold a sheet of paper into **five** identical rectangles; the fold lines should be perpendicular to the 11" side. Tape the paper into the shape of a pentagonal prism.
   b. Carefully measure and sketch the two parallel bases of this prism. The perimeter of each base should be 11 inches. Cut the bases out. Show your computational work. Hint: You can determine the length of each edge and then use a protractor to carefully mark the angle between each edge.

HEXAGONAL PRISM
   a. Using the same procedure, fold a sheet of paper into **six** identical rectangles; the fold lines should be perpendicular to the 11" side. Tape the paper into the shape of a hexagonal prism.
   b. Carefully measure and sketch the two parallel bases of this prism. The perimeter of each base should be 11 inches. Cut the bases out. Show your computational work.

II. Calculate Surface Area
Using your work from part I; compute the surface area of each of the prism.

III. Calculate Volume
Using your work from parts I & II; compute the volume of each of the prism.

Outcomes
- ✓ **measurement**
- ✓ **perimeter, circumference, area, angles, surface area and volume**
- ✓ **the Pythagorean Theorem**
- ✓ **basic geometric constructions**

Total	**#**		**Score (S)**
16	14	Fully met	$S \geq 80\%$

#		**Score (S)**
0	Partial	$70\% \leq S \leq 79\%$

#		**Score (S)**
2	Not met	$S < 70\%$
Did not do task		

LAS
Embedded Assessment Action Report

For

Program Review

Degree Program(s): __BS/BA Education

(BA, BS, BFA, MA, MS, LACC, etc.)

Course # / Title: _MTH 396 Elementary Problem Solving_____

Faculty name: __Klay Kruczek_____

Date: _____July 4, 2011_____

A) State the program **learning outcome** or **general education goal** this assessment is linked to:

- Problem Solving and Problem Writing Skills - the ability to create and understand complicated situations, which are applications of K-8 mathematical topics and to apply learned skills and techniques to resolve them.

- Ability to Model Problems - the ability to translate various real-world scenarios into mathematical models that can be explored by hands-on models, paper-and-pencil methods and technological applications where appropriate.

- Communication Skills - Ability to precisely articulate (both in writing and orally) K - 8 mathematical topics in a way that is clear and understandable to elementary and middle school students.

B) Check the embedded assessment tool(s) used :

☒ Exam question
☐ Essay
☐ Oral presentation
☐ Thesis
☒ Portfolios
☐ Practicum / Service Learning
☐ Capstone paper / project
x Other __Mentoring Project_____

Attach a copy of the actual question / assignment as it is presented to the student or a description of the embedded process.
Please submit a copy of this action report to the LAS dean's office.

Learning Outcome: Problem Writing and communication:

Portfolio Assignments for Mathematics 396

You will have **three** portfolio assignments. There are two parts to each assignment.

PART A:
Write a word problem to illustrate a given prescribed problem solving strategy. The problem should require at least three mathematical steps to solve!

- The problem should be appropriate for grades levels 4 – 7.
- Include with each problem a rubric created specifically for the problem.
- Include a solution that would receive a perfect score according to your rubric.
- Include a section giving comments for teachers.
- Try to make the problems interesting and relevant to children's lives, and thus useful for you upon entry into the teaching profession.
- Try to write each problem ON YOUR OWN, without borrowing from other resources. Cite your reference if applicable.
- Have fun and use your imagination.

Please organize your writing in the following format:

- **Problem**
- **Prescribed Strategy**
- **Rubric**
- **Solution**
- **Comments for Teachers.** The Comments for Teachers section can include ideas for (a) extending or generalizing the problem, or (b) reflective comments about which topics this problem illustrates within the elementary or middle school mathematics curriculum. *You must use a different rubric for each portfolio problem.*

DUE DATES:

- **Portfolio 1 Part A** due on 4/14: draw a diagram, use a picture, or eliminate possibilities (**a table is NOT a picture/diagram**) (choose one of these strategies)
- **Portfolio 2 Part A** due on 4/26: use sub-problems or patterns or counting techniques (choose one)
- **Portfolio 3 Part A** due on 5/26: use Venn diagrams, working backwards or algebra (choose one)

PART B: For Part B you will be looking at Portfolio PART A written by a classmate.

1. Read their problem and solution. Score their problem according to the rubric they submitted.
2. Also score their work according to the following rubric. Support your scores with comments.

Problem: Ten (10) points are given for this section of the assignment which contains the wording of the actual problem:

- Two (2) points are given for prescribing a strategy which is appropriate and efficient.

- Two (2) points are given for writing a problem that illustrates an important mathematical idea.
- Two (2) points are given for writing a multi-step problem that uses at least 3 steps.
- Two (2) points are given for an interesting story.
- Two (2) points are given for clarity and good use of language.

Prescribed Strategy: Two (2) points are given for specifying which problem-solving strategy your problem is illustrating

Rubric: Six (6) points are given for the rubric assigned as follows:
- Three (3) points for a rubric clearly stating the expectations.
- Three (3) points for a rubric which appropriately assesses the problem.

The remaining six (6) points are assigned as follows:
- Four (4) points for a complete and correct **solution** that would receive full credit according to your rubric.
- Two (2) points for the **Comments for Teachers** section.

Scoring breakdown

Strategy	0	1	2
Problem Strategy			
Idea	0	1	2
Multi-step	0	1	2
Story	0	1	2
Language	0	1	2
	0	1	2
Rubric			
Clear expectations	0	1 2	3
Appropriate	0	1 2	3
Solution	0	1 2	3 4
Comments	0	1	2

Comments:

3. After scoring their problem you will answer the following questions:
   a. What could be added to the problem to make it clearer or what information is unnecessary for the problem and does not add value?
   b. Give a specific, thoughtful suggestion on how to modify the problem to make it more difficult for an advanced learner.
   c. Give a specific, thoughtful suggestion on how to modify the problem to make it easier for a struggling learner.
   d. Comment on the rubric. Was it appropriate? Were there categories missing? List at least one change you would make to improve the rubric. Justify your change.

Learning Outcomes: Problem Solving & Ability to Model Problems

Mathematics 396 Final Exam Spring 2011

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In your groups of 3-4 please solve five out of the following six problems. Each group member is responsible for writing up at least one solution. Your answer will be graded on interpretation, strategy, accuracy, completeness and clarity so be sure to explain yourself well. You will not be graded on reflection, but it is always a good idea to check your work. After you write up a solution it is a good idea to have the other group members proofread it. Each problem is worth 20 points.

Problem 1: Maile was driving through the Midwest recently and happened to tune in to a country music station. After having listed to the station for an hour, Maile had heard 25 songs. All but 1 were about either truck drivers, being in love, hound dog owners, or some combination of the three. She noted the following information:

a. All of the truck drivers were in love.
b. Three-fourths of the truck drivers were not hound dog owners.
c. There were six hound dog owners who were in love.
d. Of the hound dog owners who were not truck drivers, half of them were in love.
e. Eighty percent of all the songs concerned people in love.

How many songs concerned people who were in love but were not truck drivers or not hound dog owners?

Problem 2: Kate had three African snails named Sluggo, Pokey, and Lag. Each of the snails loves to eat lettuce. One day, Kate gave each snail the same number of heads of lettuce. The snails started munching away. Each snail ate at a constant rate of speed. When Sluggo finished all of his heads of lettuce, Pokey had 17 heads left and Lag had 26 heads left. When Pokey finished all of his lettuce, Lag had 12 heads left. How many heads of lettuce did each snail start with? (Assume each snail started with fewer than 100 heads of lettuce.)

Problem 3: Both contestants on the game show *Math Masters* were excellent mathematicians. The host gave each of them a positive whole number and told them that the product of their numbers was 15, 20, 24, or 28. The first contest to determine the other's number would be the winner. It was not possible for either contestant to determine the other's number immediately. Both contestants thought about it and made some notes. Finally, one contestant determined the other contestant's number. What was the **loser's** number?

Problem 4: I walk 6 feet/second, and I run three times as fast. Last night I was walking across a four-lane street. Halfway across the street, I noticed a car to my right that was just passing a fire hydrant. I started running, because the car was driving too fast for my sense of safety. It took 8 seconds for me to cross the street. One second after I reached the curb, the car sped by me. I then turned right and started walking again. I walked a distance that was three times the distance across the street until I reached the fire hydrant. How fast was the car moving in miles per hour (recall there are 5280 feet in a mile).

Problem 5: A group of 34 adults and 27 children comes to a river they wish to cross. They find a small boat that will hold 1 adult or 2 children. Everyone is able to row the boat. **a)** Show that everyone can get across the lake in 187 trips. (Count trips as one-way.) **b)** Find a formula for the smallest number of trips it will take for any group of adults and children to cross. Find the formula in terms of variables A=number of adults and C=number of children.

Problem 6: For Mandy's graduation, her family went out to dinner at a Mexican restaurant. The restaurant served a bowl of chips for every three people, a bowl of salsa for every two people, and a bowl of guacamole for every four people. There were seven more bowls than people. How many bowls of each type of food were there?

Learning Outcome: Communication Skills

Drexel Online Mentoring Assignment: The students participate in the Drexel online Math Forum mentoring program. Middle and high school students from around the country submit solutions to the Math Forum's "Problem of the Week". Our WOU students mentor these students by grading their responses via a scoring rubric, then writing a mentoring reply to give the students advice on how to improve their solution. The students who receive the reply have the opportunity to submit a revision and get re-graded by their WOU mentor.