KANSAS CORE OUTCOMES PROJECT

3/20/06

REPORT FOR SYSTEM COUNCIL OF CHIEF ACADEMIC OFFICERS
PREPARED BY
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BACKGROUND

The Kansas Core Outcomes Project was initiated in 1999 by the Kansas Council of Instructional Administrators, a group comprised of the chief academic officers of the state's community college and vocational-technical schools/colleges. The goal of this project was to develop core outcomes and competencies for general education courses at the state's colleges and universities.

The first meeting for the project was held in fall 1999 at the Southside Educational Center in Wichita. Faculty were invited to that meeting from the state's 19 public community colleges, six Regents' universities and Washburn University and represented six disciplines – biology, computer science, English, mathematics, sociology, and speech. A second meeting, in spring 2000, was conducted at Emporia State University, and three additional disciplines – history, chemistry, and psychology – were added to that initial group of six. A third meeting, again at Southside, was conducted in January 2001. Another meeting of the core competency groups was held in September of 2002. In addition, disciplines such as English, speech and mathematics have scheduled other, independent meetings subsequently.

The Core Competency meetings were originally financed through the KCIA budget. Each institution made a commitment to their faculty and supplied them with finances for lunch and travel. Due to increased budget decreases and the time commitment for our faculty, it was decided that the meetings would be held annually in the fall semester in the coming years.

On September 16, 2005, approximately 175 faculty members gathered at the Southside Educational Center once again to review and reevaluate the competencies previously selected in specific core general education courses. Disciplines meeting this year included: biology, computer science, English, world history, psychology, mathematics, sociology, anthropology, early childhood education, and theatre.

Appendix I of this document lists the faculty who participated in the Fall 2005 core outcomes meeting. To provide a more complete history and documentation of the core outcomes project, Appendix II contains the previous (Fall 2004) report of the project.

MATH

MARK WHISLER, CLOUD COUNTY, AND
JACK PORTER, UNIVERSITY OF KANSAS, FACILITATORS

Meeting Minutes:

Representatives from 18 community colleges, five state universities, and Washburn University met Friday, September 16, 2005 at the Southside Education Center in Wichita, Kansas. Dr. Jack Porter opened and presided over the meeting.

Discussion began with how earlier work had been integrated into courses and quickly moved on to a discussion of Statistics courses and a general discussion of transferability of courses from community colleges to four-year schools. A motion was made to accept competencies for a first Statistics course, and the vote to approve was unanimous.

Discussion then moved on to an alternative terminal course to College Algebra. The discussion was relatively brief. One comment that was made was that it would be up to the four-year schools to drive any efforts in this area, because of transferability issues.

Next came a presentation by Mike Martin of Johnson County CC about how calculus courses for Life Science students was in the process of reform. Information was presented about a course that Johnson County currently offers that is in the forefront of such reform efforts. He made a plea for the group to consider competencies for such a course, but the comment was made that this may be a course ahead of its time. An agreement was reached that Mike should come up with language that could be presented to biology faculty, in the hopes of working in cooperation with them to develop such a course.

Finally, the main topic of discussion was a set of competencies for a traditional calculus course for science and engineering students. The discussion quickly focused on where to stop the course, and whether an emphasis on an early introduction to transcendental functions was warranted. Agreement was reached that this was the case, and that some applications of integration should be sacrificed as a result. An agreement was reached on a draft outline, which follows below. This should be discussed over the coming year in department, and then next year we will vote on the document.

Content Outline & Competencies for Engineering Calculus I:

I. Using Limits
  A. Evaluation of limits
    1. Evaluate the limit of a function at a point both algebraically and graphically.
    2. Evaluate the limit of a function at infinity both algebraically and graphically.
    3. Use the definition of a limit to prove a value for the limit of a function.
  B. Use of limits
    1. Use the limit to determine the continuity of a function.
    2. Apply the Intermediate-Value Theorem.
    3. Use the limit to determine differentiability of a function.
  C. Limiting process
    1. Use the limiting process to find the derivative of a function.

II. Finding Derivatives

A. Find derivatives involving powers, exponents, and sums.
B. Find derivatives involving products and quotients.
C. Find derivatives using the chain rule.
D. Find derivatives involving exponential,logarithmic and hyperbolic functions *.
E. Find derivatives involving trigonometric and inverse trigonometric functions *.
F. Find derivatives using implicit differentiation.
G. Use the derivative to find velocity, acceleration, and other rates of change.
H. Use the derivative to find the equation of a line tangent to a curve at a given point.

III. Using Derivatives

A. Curve sketching
1. Use the first derivative to find critical points.
2. Apply the Mean-Value Theorem for derivatives.
3. Determine the behavior of a function using the first derivative.
4. Use the second derivative to find inflection points.
5. Determine the concavity of a function using the second derivative.
6. Sketch the graph of the function using information gathered from the first and second derivatives.
7. Interpret graphs of functions.

B. Applications of the derivative
1. Use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry.
2. Solve related rates problems.
3. Use Newton's Method **.
4. Use differentials to estimate change.

IV. Finding Integrals

A. Find area using Riemann sums and integrals.
B. Express the limit of a Riemann sum as a definite integral.
C. Evaluate the definite integral using geometry.
D. Integrate algebraic, exponential, and trigonometric functions.
E. Evaluate definite integrals using the Fundamental Theorem of Calculus.
F. Apply the Mean-Value Theorem for integrals.
G. Integrate indefinite integrals.
H. Integrate using substitution.
I. Integrate using numerical techniques.

V. Using the Integral

A. Solve a differential equation by separation of variables.
B. Solve initial value problems.
C. Solve applications of exponential increase and decrease.

* = Optional for Calculus I, but to be included in Calculus II if not in Calculus I
** = Totally Optional

MATH

TED KALTHOFF, CLOUD COUNTY, FACILITATOR
JACK PORTER, UNIVERSITY OF KANSAS, FACILITATOR (2004)

INTRODUCTION

The Math Core Competencies Group has met several times and has had very productive meetings. At the Fall 2002 meeting we had all seven of the four-year state universities participating and fifteen of the nineteen community colleges participating. During the time that the group has met all four-year and two-year schools have attended and participated. When schools have been unable to attend they have forwarded materials about the course the group would be dealing with.

Ted Kalthoff, Vice President for Academic Affairs, Cloud County Community College, has opened each of these meetings; however, the discussion on course names and competencies has been led by one of the math faculty. The two leaders of the group have been Jack Porter, University of Kansas, and Carolyn Neptune, Johnson County Community College.

The group has established core competencies and agreed upon common names in four courses and are working on a fifth course. The four completed courses are:

COLLEGE ALGEBRA
INTERMEDIATEA ALGEBRA
ELEMENTARY ALGEBRA
TRIGONOMETRY

The group has agreed upon these names and has requested that the Chief Academic Officers endorse these common names and competencies. They also have requested that the Chief Academic Officers assist in working towards the adoption of these names and the use of these competencies on their campuses.

The fifth course that the group is working on is General/Business Calculus. This has been a more difficult course to work on because of the variation from campus to campus. Also the four-year schools have expressed the problems they have in trying to meet the needs of their various colleges through this course. This was the topic of conversation at the Fall 2002 meeting and will be addressed again at the Fall 2003 meeting. The group also plans to start working on the Statistics course when they conclude their work on General/Business Calculus.

The entire group has been very supportive of these meetings and hopes they are continued and supported. They have provided the opportunity to establish seamless education when students transfer from one institution to another and have provided the math faculty an opportunity to discuss issues related to these courses and transfer of math courses in general.

At the Fall, 2004, meeting, the group undertook considerable discussion about the nature of the College Algebra course, and who the target audiences are. The group talked about the difference between College Algebra and Pre-Calculus courses, and the different populations served by these courses. National trends in College Algebra were also briefly discussed. Discussion about transferability and seamless transitions also took place. The group made small changes to the College Algebra competencies, specifically to include material on matrices. In approving these competencies and those for trigonometry, the mathematics group emphasized that the competencies listed are minimum competencies, and that these courses may have additional competencies which vary by institution.

ELEMENTARY ALGEBRA
COURSE OUTCOMES AND COMPETENCIES

It is assumed students entering an Elementary Algebra course will have the outcomes and competencies from prerequisite courses. Students will be expected to use appropriate technology as one tool to achieve competency in Elementary Algebra.

I. ARITHMETIC AND ALGEBRAIC MANIPULATION
- a. Evaluate arithmetic expressions (including absolute values) using the order of operations and properties of real numbers
- b. Evaluate algebraic expressions
- c. Apply the laws of exponents to simplify expressions containing integer exponents
- d. Express numbers in scientific notation
- e. Perform addition, subtraction, multiplication and division on polynomial expression
- f. Factor expressions with common factors, expression that require grouping, trinomial expressions, and difference of square expressions
- g. Perform addition, subtractions, multiplication, and division on rational expressions
- h. Evaluate radicals, approximating those that are irrational
- i. Simplify numeric radicals using the product and quotient rules

II. Equations and Inequalities
- a. Solve linear equations in one variable
- b. Solve proportion equations
- c. Solve linear inequalities in one variable showing solutions on a number line
- d. Solve literal equations that do not require factoring
- e. Solve quadratic equations by factoring
- f. Develop and solve mathematical models including number, geometry, and percent applications

III. Graphs on a Coordinate Plane
- a. Plot points on a coordinate plane
- b. Graph linear equations, by plotting points
- c. Graph linear equations using intercepts
- d. Graph linear equations using the y-intercept and slope

IV. Analysis of Equations and Graphs
- a. Identify the x-intercept, y-intercept, and slope of the line given its graph
- b. Identify the x-intercept, y-intercept, and slope of the line given its equation
- c. Determine the equation of a line given its graph, its slope and y-intercept, and its slope and a point
- d. Determine equations of both horizontal and vertical lines
- e. Determine whether or not an equation is linear
- f. Calculate the slope of a line passing through two given points

INTERMEDIATE ALGEBRA
COURSE OUTCOMES AND COMPETENCIES

It is assumed students entering an Intermediate Algebra course will have the outcomes and competencies from prerequisite courses. Students will be expected to use appropriate technology as one tool to achieve competency in Intermediate Algebra.

I. Arithmetic and Algebraic Manipulation
   a. Factor quadratic, quadratic forms, special forms and grouping
   b. Perform addition, subtraction, multiplication, and division on rational expressions
   c. Simplify complex fractions
   d. Apply the laws of exponents to simplify expressions containing rational exponents
   e. Apply the laws of radicals to perform, addition, subtraction, and multiplication
   f. Rationalize denominators containing radicals
   g. Simplify radicals containing negative radicands
   h. Perform operations with complex numbers
   i. Evaluate functions using function notation

II. Equations and Inequalities
   a. Solve linear inequalities in one variable showing solution on a number line and in interval notation
   b. Solve literal equations including those that require factoring
   c. Solve systems of linear equations in two variables
   d. Solve equations by factoring and quadratic formula
   e. Solve equations containing rational expressions
   f. Solve equations containing radicals
   g. Solve linear absolute value equations and inequalities in one variable
   h. Develop and solve mathematical models including variation, mixture, motion, work and geometrical applications

III. Graphs on a Coordinate Plane
   a. Graph linear inequalities
   b. Graph quadratic functions

IV. Analysis of Equations and Graphs
   a. Determine an equation of a line given two points, perpendicular to a given line, through a specific point, parallel to a given line through a specific point
   b. Calculate the distance between two points
   c. Distinguish between functions and non-functions using the vertical line test
   d. Identify the domain and range of a function given its graph

COLLEGE ALGEBRA
COURSE OUTCOMES AND COMPETENCIES

Revised/updated 9/17/04

It is assumed that students entering a College Algebra course will have competencies from previous courses. Students will be expected to use appropriate technology as one tool to achieve competency in this course. The student will:

I. Analysis and Graphing of Functions and Non-functions
- a. Use function notation.
- b. Recognize equations of functions and non-functions
- c. Use concepts of symmetry, intercepts, left-to-right behavior, asymptotes, and transformations to sketch graphs of functions (constant, linear, quadratic, absolute value, square root, cubic, polynomial, rational, exponential and logarithmic) or non-functions (circles), given their description.
- d. Determine the domain and range of a function.
- e. Write the equation of a function or non-function listed in I (c), given its description.
- f. Use graphs of functions for analysis.
- g. Find combinations and composites of functions.
- h. Find inverses of functions

II. Solution of Equations and Inequalities
- a. Solve the equations listed in I (c)
- b. Solve the following types of inequalities:
    1. linear
    2. polynomial
    3. rational
    4. absolute value
- c. Solve systems of inequalities by graphing
- d. Apply equations from I (c). Examples include, but are not limited to, growth and decay, depreciation, and trajectories.
- e. Examine and analyze data, make predictions/interpretations, and do elementary modeling.
- f. Solve systems of equations using various methods, including matrices.

TRIGONOMETRY
COURSE OUTCOMES AND COMPETENCIES

Revised/updated 9/17/04

It is assumed that students entering a Trigonometry course will have competencies from previous courses. Students will be expected to use appropriate technology as one tool to achieve competency in this course. The student will:

1. Understand the basic definitions of trigonometric functions using both a right triangle and the unit circle.
2. Solve right triangles, and know trigonometric function values for special angles.
3. Understand radian definition and measurement, and understand circular functions as real-valued functions.
4. Analyze the graphs of the six basic trigonometric functions and their arithmetic combinations using the concepts of period, phase shift, amplitude, and displacement.
5. Derive/verify trigonometric identities, including but not limited to double angle, half angle, angle sum and angle difference identities.
6. Define, graph, and analyze inverse trigonometric functions.
7. Solve equations involving trigonometric functions.
8. Find solutions of oblique triangles using the Law of Cosines or Law of Sines.
9. Solve applications, including but not limited to vectors.

MATH – Elementary Algebra

Institution	Course Title	Course #	Currently Adopted Textbook
Allen County	Beginning Algebra	MAT 015	Beginning Algebra, Lial, Hornsby, 8th edition
Barton County	Intermediate Algebra	MATH 1824	Interactive Mathematics, Intermediate Algebra. Academic Systems Corporation, 1997-2000.
Butler County	Fundamentals of Algebra	MA 060	Gustafson, R. David, and Frisk, Peter D. (2002). Beginning & Intermediate Algebra, (3rd ed.)
Cloud County	Elementary Algebra	MA 099	
Coffeyville	Introductory Algebra	32.005.	Beginning Algebra 8th Ed.
Colby	Beginning Algebra	MA076	Beg. & Interim Alg.: An Integrated Appr. 3rd ed.
Cowley	Beginning Algebra	MTH 4405	
Dodge City	Elementary Algebra	MATH 090	
ESU			
FHSU	NA		
Ft. Scott	Elementary Algebra	MAT0953	Algebra: Combined Approach 2nd ed.
Garden City	Beginning Algebra	MATH 006	
Highland	Beginning Algebra	MAT 100	Beginning Algebra 5th ed. Tobey et.al.
Hutchinson	Basic Algebra	MA 099	
Independence	Fundamentals of Math	DEV 0324	Basic College Math, Aufmann
JCCC	Introduction to Algebra	MATH 115	Introductory Algebra for College Students (Blitzer)
KCKCC	Elementary College Algebra	MATH 099	Dugopolski, Elementary and Intermediate Algebra with CD, McGraw Hill, 2002
KSU	K-State does not offer such a course.		
KU	NA		
Labette	Beginning Algebra	MA 1717	
Neosho	Elementary Algebra	MATH 011	Elementary Alg. & Intermediate Alg.
PSU	General Elective	GEN XXX	NA
Pratt	Beginning Algebra	MTH076	Beginning Algebra 5th ed. Aufmann
Seward	Beginning Algebra	MA 0043	
Washburn	Basic Algebra	MA 103	
WSU	no credit		

Intermediate Algebra

Institution	Course Title	Course #	Currently Adopted Textbook
Allen County	Intermediate Algebra	MAT 020	Intermediate Algebra, Lial, Miller, and Hornsby
Barton County	Intermediate & College Algebra	MATH 1826	
Butler County	Intermediate Algebra	MA 125	Gustafson, R. David, and Frisk, Peter D. (2002). Beginning & Intermediate Algebra, (3rd ed.)
Cloud County	Intermediate Algebra	MA 110	
Coffeyville	Intermediate Algebra	27.102.	Intermediate Algebra 8th Ed.
Colby	Intermediate Algebra	MA177	Acad. Syst.-Comp. CD's & Pers. Acad. Ntebook(PAN)
Cowley	Intermediate Algebra	MTH 4410	
Dodge City	Intermediate Algebra	MATH 091	
ESU			
FHSU	Intermediate Algebra	MATH 010	Intermediate Algebra by Larson
Ft. Scott	Intermediate Algebra	MAT1073	Algebra: Combined Approach 2nd ed.
Garden City	Intermediate Algebra	MATH 107	
Highland	Intermediate Algebra	MAT 103	Intermediate Algebra. 4th Ed. Tobey et.al.
Hutchinson	Intermediate Algebra	MA 105	Intermediate Algebra, 5th, 3rd Ed, Larson/Hostetler, Houghton, Mifflin
Independence	Intermediate Algebra	DEV 0334	Introductory Algebra, Aufmann
JCCC	Intermediate Algebra	MATH 116	Intermediate Algebra (McKeague)
KCKCC	Intermediate College Algebra	MATH 104	Dugopolski, Elementary and Intermediate Algebra with CD, McGraw Hill, 2002
KSU	Intermediate Algebra	MATH 010	Steps in Math Modules, Modules 1-5, Varney's Bookstore, ISBN 0-8403-0140-2. College Algebra Primer, Hawkinson, Kendall Hunt, 1st ed. ISBN: 0-8403-6014-2. Intermediate Algebra Manual, Hawkinson & O'Neill, Varney's Bookstore.
KU	Intermediate Mathematics	MATH 002	
Labette	Intermediate Algebra	MA 1718	
Neosho	Intermediate Algebra	MATH 112	
PSU	Intermediate Algebra	MATH 019	Intermediate Algebra, 6th ed., Bittinger
Pratt	Intermediate Algebra	MTH1130	Intermediate Algebra 5th Ed. Aufmann
Seward	Intermediate Algebra	MA 1103	
Washburn	Intermediate Algebra	MA 104	
WSU	no credit		

College Algebra

Institution	Course Title	Course #	Currently Adopted Textbook
Allen County	College Algebra	MAT 105	College Algebra, 8th Edition, Lial, Hornsby, and Schneider
Barton County	College Algebra	MATH 1828	Larson, Hostetler. College Algebra, 5th Edition. Houghton Mifflin Company, 2001.
Butler County	College Algebra	MA 135	Dwyer, D., Gruenwald, M. (2000). College Algebra: A contemporary Approach, 2nd ed.
Cloud County	College Algebra	MA 111	
Coffeyville	College Algebra	27.105.	College Algebra 8th Ed.
Colby	College Algebra	MA178	Acad. Syst.-Comp. CD's & Pers. Acad. Ntebook(PAN)
Cowley	College Algebra	MTH 4420	
Dodge City	College Algebra	MATH 106	
ESU			
FHSU	College Algebra	MATH 110	College Algebra with Graphic Approach by Barnett
Ft. Scott	College Algebra	MAT1083	College Algebra 6th ed.
Garden City	College Algebra	MATH 108	
Highland	College Algebra	MAT 104	College Algebra. 7th ed. Barnett et.al.
Hutchinson	College Algebra	MA 106	College Algebra, 5th ed, Larson/Hostetler, Houghton Mifflin
Independence	College Algebra	MAT 1023	Algebra for College Students, Kaufmann
JCCC	College Algebra	MATH 171	College Algebra (Larson/Hostetler)
KCKCC	College Algebra	MATH 105	Bittinger, Beecher, Ellenbogen, & Penna, College Algebra, Addision Wesley, 2nd Ed., 2001 – TI-83 required
KSU	College Algebra	MATH 100	College Algebra, Larson & Hostetler, Houghton Mifflin, 5th ed., ISBN: 0-618-18522-4.
KU	Algebra	Math 101	
Labette	College Algebra	MA 1719	
Neosho	College Algebra	MATH 113	
PSU	College Algebra with Review	MATH 110	Algebra for College Students, 6th ed., Gustafson
Pratt	College Algebra	MTH178	College Algebra by Aufmann 4th ed. 02
Seward	College Algebra	MA 1173	
Washburn	College Algebra	MA 116	
WSU	College Algebra	MATH 111	College Algebra w/Tutorial CD

Trigonometry

Institution	Course Title	Course #	Currently Adopted Textbook
Allen County	Plane Trigonometry	MAT 106	Trigonometry by Lial/Miller
Barton County	Trigonometry	MATH 1830	Lial, Hornsby, and Schneider. Trigonometry, Seventh Edition. Addison-Wesley, 2001.
Butler County	Trigonometry	MA 140	Lial, Hornsby, Schneider (2001). Trigonometry (7th ed.)
Cloud County	Trigonometry	MA 112	
Coffeyville	Trigonometry	27.106.	Trigonometry 6th Ed.
Colby	Plane Trigonometry	MA122	Plane Trigonometry, 4th Ed.
Cowley	Trigonometry	MTH 4425	
Dodge City	Trigonometry	MATH 110	
ESU			
FHSU	Plane Trigonometry	MATH 122	Trigonometry by Sullivan
Ft. Scott	NA		
Garden City	Plane Trigonometry	MATH 109	
Highland	Plane Trigonometry	MAT 105	Analytic Trigonometry, 7th ed., Barnett
Hutchinson	Plane Trigonometry	MA 107	Trigonometry, 4th ed, McKeague, HBJ/WB Saunders
Independence	Plane Trigonometry	MAT 1093	Trigonometry, Dugopolski
JCCC	Trigonometry	MATH 172	Trigonometry (McKeague)
KCKCC	Trigonometry	MATH 112	Lial, Hornsby, and Schneider. Trigonometry, Addison Wesley, 7th Ed, 2001, TI 83 required
KSU	Trigonometry	MATH 150	Fundamentals of Trigonometry, Swokowski & Cole, Brooks/Cole Publishing, 9th ed., ISBN: 0-534-36128-5.
KU	Trigonometry	MATH 103	
Labette	Trigonometry	MA 1730	
Neosho	Trigonometry	MATH 122	
PSU	Plane Trigonometry	MATH 122	Analytic Trigonometry, 7th ed., Barnett
Pratt	Trigonometry	MTH183	College Trigonometry 4th ed. 02 Aufmann
Seward	Trigonometry	MA 1183	
Washburn	Trigonometry	MA 117	
WSU	College Trigonometry	MATH 123	Trigonometry w/CD

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Mathematics

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Tom Worthing	Hutchinson Community College