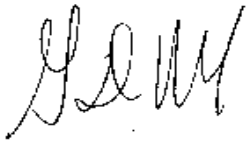
Recommendation 2013-01-05: UNIVERSITY SENATE RECOMMENDATION TO THE PROVOST
The University Senate recommends approval of MATH 116, as per the report from the Colonnade Implementation Committee dated 01-11-2013.

Approved 1/28/2013



Gordon Emslie

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MATH 116 General Education Proposal

1. **A sample syllabus for this course (see below)**

2. **Statement of how your course meets the Colonnade Plan's learning objectives.**

MATH 116: College Algebra (3 hours) meets the five learning objectives included in the Quantitative Reasoning section of the Colonnade Plan. MATH 116 students will learn to interpret, illustrate, and communicate mathematical ideas. Further, students will learn to model and solve problems. Students with a Math ACT of 26 or higher will receive 3 hours credit for this requirement. MATH 116 specifically meets the five learning objectives as detailed below:

Learning Objective 1: Interpret information presented in mathematical and/or statistical forms.

Students in MATH 116 learn to interpret information presented in mathematical form by first learning to recognize the presence of mathematical information such as functions, equations, graphs, tables, diagrams, figures or descriptive text; and secondly, to accurately interpret how to use that information in the context of a given problem.

Specifically, students learn to:

- Recognize the graph of a circle and identify its center, radius and diameter.
- Distinguish between linear and non-linear data.
- Identify linear, quadratic, polynomial, rational, exponential and logarithmic functions expressed symbolically.
- Recognize the graph of a linear function and identify its slope, x- and y-intercepts, domain and range, and whether it is increasing, decreasing or constant.

- Recognize the graph of a polynomial function and identify its relative and absolute extrema, zeros, y-intercepts, domain and range, and the intervals over which it is increasing and decreasing.
- Recognize the graph of a rational function and identify its asymptotes, zeros, y-intercepts, domain and range, and the intervals over which it is increasing and decreasing.
- Recognize the graphs of exponential and logarithmic functions, identify their zeros and y-intercepts, intervals over which they are increasing or decreasing, and their domains and ranges.

Learning Objective 2: Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.

Students in MATH 116 learn to illustrate and communicate mathematical information symbolically by learning when and how to express solutions to linear, quadratic, polynomial, rational, exponential and logarithmic functions symbolically.

Students in MATH 116 learn to illustrate and communicate mathematical information visually by learning how to graph linear, quadratic, polynomial, rational, exponential and logarithmic functions.

Students in MATH 116 learn to illustrate and communicate mathematical information numerically by learning when and how to use tables to express quantitative information.

Learning Objective 3: Determine when computations are needed and execute the appropriate computations.

Students in MATH 116 learn to determine when computations are needed and execute the appropriate computations through exercises that develop skill in recognizing the techniques required to solve a problem and carrying out the necessary algebraic procedures accurately and efficiently.

Specifically, students learn techniques and develop skill in executing the following computations:

- Solving linear equations and inequalities.
- Computing the slope and x- and y-intercepts of linear functions.
- Computing the midpoint and length of a line segment.

- Solving quadratic equations and inequalities.
- Computing the vertex, axis of symmetry, zeros and y-intercepts of quadratic equations.
- Solving higher degree polynomial equations and inequalities.
- Finding the zeros of polynomial functions.
- Solving rational equations and inequalities.
- Finding the asymptotes and zeros of rational functions.
- Solving exponential and logarithmic equations.
- Solving systems of equations in two and three variables.

Learning Objective 4: Apply an appropriate model to the problem to be solved.

Students in MATH 116 learn to apply an appropriate model to the problem to be solved via exercises designed to teach recognition of which algebraic function, expression or equation (e.g. linear, polynomial, rational, logarithmic, exponential) appropriately models a given problem and to develop skill in performing such applications.

Learning Objective 5: Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.

Students in MATH 116 learn to make inferences, evaluate assumptions and assess limitations in estimation modeling via application exercises which require applying and interpreting domain, range, extrema, intercepts, asymptotes, etc. in the context of specific problems in finance, business, medicine, physics and biology.

3. Brief description of how your department will assess this course's effectiveness.

For MATH 116, assessment will occur at the end of the semester. To assess the course objectives, each student will complete a problem that addresses the five learning objectives. A committee of at least three faculty members will select a sample and evaluate the common assessment problem that addresses the skills and concepts as stated in the learning outcomes. The committee will randomly collect 25% to 30% of the sample across all sections of MATH 116 to help assess students' mastery of the learning outcomes. The following criterion will be used to assess student learning outcomes:

Each test question will be scored on scale of 0 to 5, using a scoring guide developed by the committee in conjunction with the department. A common rubric (5 -Excellent ; 4 - Good; 3 - Satisfactory; 2 - Poor; 0 and 1- Fail).

The goals will be as follows:
Satisfactory = at least 70% of students scored 3 or better
Unsatisfactory = under 70% of students scored 3 or better

4. **If necessary, a list of any proposed revisions needed to bring your course in line with the Colonnade Plan.**

   MATH 116 will be re-evaluated at the end of each academic year to determine if the learning objectives are being met, and will be updated accordingly.

Sample Syllabus Statement
Math 116: College Algebra

The following items will be included in all Math 116 syllabi.

Course Description:

This course provides students with the ability to understand and apply mathematical skills and concepts. Math 116 students will be able to: use fundamental mathematical reasoning principles; interpret information presented in tables or graphical displays; use graphical, symbolic, and numeric methods to solve practical problems; and apply an appropriate mathematical model to the problem to be solved.

The content of the course will include:

- Introduction to Functions
- Linear and Quadratic Functions
- Polynomial and Rational Functions
- Exponential and Logarithmic Functions
- Systems of Equations

Learning Objectives:

This course fulfills the Quantitative Reasoning requirement in the Foundations category of WKU's Colonnade program. As part of that program, Math 116 has the following learning objectives:

Students will demonstrate the ability to:

1. Interpret information presented in mathematical and/or statistical forms.
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually and/or numerically.
3. Determine when computations are needed and execute the appropriate computations.
4. Apply an appropriate model to the problem to be solved.
5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis.