

**Department of Mathematical Sciences  
Northern Illinois University**

**MATH 416  
Topics in Mathematics for Teachers**

Course Goals:

Students in this course should be able to:

- Model various situations involving multiple related quantities whose relationships are proportional, linear, quadratic, exponential, logarithmic, rational, or periodic.
- Explain the appropriateness of functional expressions in a modeling context by referring to underlying mathematical meanings for key functions and operations.
- Interpret and translate between verbal, algebraic, graphical, and numerical representations of quantitative relationships.
- Identify and explain the role of quantitative and covariational reasoning in various mathematical contexts and how students at varying levels of each type of reasoning might act in solving problems in those contexts.
- Identify and explain the role of mathematical practices and conventions in analyzing mathematical representations and solving standard mathematical tasks in the secondary mathematics curriculum.
- Engage in meaningful mathematical dialogue by listening to and being able to rearticulate one another's mathematical explanations whether they match or differ from one's own.
- Interpret, assess, and respond to common student solutions and explanations regarding their mathematical appropriateness, relation to key mathematical ideas, and construction of standard ways of reasoning about and solving mathematical tasks.

**Course Content**

This course intends to develop key mathematical concepts from the high school curriculum from a *cognitive* standpoint as well as a *mathematical* one. We will identify key modes of reasoning that are essential to student understanding of secondary and beginning university mathematics including:

- function co-variation
- rate of change
- ratio concepts
- proportionality and linearity
- exponential relationships
- logarithmic relationships
- trigonometric relationships
- periodicity, and
- quantitative reasoning.

We will take a problem solving approach to many of the tasks we engage in both because we shall emphasize meaning making at every step, but also because we shall need meaningful contexts to help us recognize when our own understanding is insufficient. We shall make continual reference to issues of teaching and learning and use our mathematical discussions to reflect on high school curriculum and instruction.

**Course Requirements**

- Course attendance and participation
- Homework assignments
- Final project
- Final examination

**Current Textbook**

Carlson, M. & Oehrtman, M. (2012) Precalculus: Pathways to Calculus, A Problem Solving Approach.

Rationalreasoning.net [ISBN: 978-0-9845795-6-3]

### **NIU Students and Conduct**

It is expected that all NIU students abide by the NIU student handbook regarding conduct. Academic misconduct will be treated and reported according to the NIU guidelines.

### **Students with Disabilities**

NIU abides by Section 504 of the Rehabilitation act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing accommodation you may need. If you have not already done so, you will need to register with the Disability Resource Center (formerly ACCESS Center) on campus. The telephone number of the Disability Resource Center is 815 -753-1303. This center provides services such as administering exams with accommodations for students with disabilities

**Changes may be made in the syllabus when judged appropriate by the instructor. Such changes, should they occur, will be announced in class.**