

Content Refresher and Pedagogy Enhancement for Teachers: Pre-Calculus

COURSE SYLLABUS: (MTE 502—3 graduate credits)

Prerequisites Knowledge of Pre-Calculus content and an undergraduate degree.

General Description The primary goal of this class is for the student to begin to acquire the techniques necessary to effectively teach Pre-Calculus at the secondary level. This course will focus on the investigation of materials, pedagogy, and technology to teach Pre-Calculus and to refresh content knowledge in ways that conform to the National Council of Teachers of Mathematics (NCTM) standards. Students will examine strategies and skills to creatively engage secondary level mathematics students as they begin to master Pre-Calculus.

Objectives This course is intended to provide appropriate training for the Pre-Calculus teacher by providing opportunities to

- understand the core concepts of each content area through exploration of problems as they relate to teaching and learning strategies for the specific topics;
- develop an understanding of the role of investigative experiences in each content area which lead to the discovery of key mathematical relationships;
- gain an historical perspective on the development of mathematics in diverse cultures;
- develop specific methods, ideas, materials, models, and activities for teaching the different content that encourage flexible and resourceful problem solving;
- develop methods and ideas for appropriate uses of technology in both teaching and discovery;
- use the different content areas of mathematics as a source of mathematical models in the natural world;
- develop a strong understanding of the different content areas and their roles in the K–12 mathematics.

Text and Materials

Teaching Secondary Mathematics, Third Edition, Brumbaugh and Rock

Navigating Through Mathematical Connections 9 - 12, National Council of Teachers of Mathematics

Navigating Through Number and Operations 9 – 12, National Council of Teachers of Mathematics

Technology requirements: Computer access with Internet with sufficient bandwidth to stream online videos (i.e., DSL, Cable modem, or T1/T3). Access to email account. DVD player (television or computer).

Blackboard: Students will be given access to the course website through Blackboard. The course materials will ONLY be accessible when you login to the course website. You must have an email address and update the site to include your active email. All questions and assignments should be emailed to the address provided on the website. All emails MUST have the subject with the course number followed by the student's last name, comma and first name (for example: MTE 502 Smith,

John). **To protect the professor's computer from potential viruses, no email will be opened unless the subject is in the correct format.** It is the student's responsibility to save all work until a final grade has been issued, in case assignments need to be resent.

DVDs: Four DVDs are provided that contain content information for this course. This information is supplemental and should be used by the student to review content information when necessary.

In addition, practice problem sets are located on the course web site. They are representative of the content knowledge required on the quizzes and the final exam.

Graphing Calculator: The use of a graphing calculator is required. While participants may use any graphing calculator, the supplemental DVDs use the TI-83. The TI-84 is very similar and can be used as well. Knowledge and competence for use of other graphing calculators will be the sole responsibility of the participant.

Course Requirements

This course will be offered through Distance Education. Participating teachers may take up to nine months to complete all requirements. There are no scheduled class sessions or meetings. There is an Internet web site that contains practice problems, three activity packets, three quizzes and a cumulative Final Examination. Modules must be completed sequentially. Each module (activity, practice problems, blog entries and quiz) must be COMPLETE prior to beginning the next module.

Each module includes a reading component. Students are expected to use the activity packet essay as a catalyst for analysis of reading content. The essay should reflect not only knowledge of the content but demonstrate a deep understanding of how this knowledge impacts the teaching of mathematics. The content of the reading will also be covered on the quizzes and the final exam.

Each module includes a set of practice problems (answers are included). These problems are recommended (but will not be submitted for grading) to assess the student's recall of the required level of mastery of the mathematical content. If the content knowledge is deficient, the student should use the DVDs to achieve this level since this content will be included on the quizzes and the final exam.

Some modules include reading and activities from the *Navigating* texts. These activities should be completed to aid the student in gaining a rich understanding of the teaching of Pre-Calculus. As with the reading, the essay should include the analysis and synthesis of all of components of the module. This material will also be included on the quizzes and the final exam.

Course Timeline

I. Complete each module using the following sequence.

1. Complete practice problems – use DVDs to aid in mastery as needed
2. Complete readings and associated materials
3. Complete Activity Packet
4. Submit Essay (if assigned)
5. Complete online quiz - Essay must be submitted prior to taking the quiz.

II. Complete Final exam – all modules must be completed prior to taking the exam.

Course Policies

1. The participant must master the material assigned for each module.
2. Participants must complete the three activity packets and the four practice problem sets that are provided on the course web site.
3. Each of the four modules will have an accompanying timed quiz posted on Blackboard. The participant must complete each of these quizzes online.
4. There will be a cumulative final examination. The participants will complete the final exam in the presence of a school or district administrator, have the administrator sign the Proctor Form and mail the Proctor Form and pages used to work out problems on the exam to Tania McDuffie, 226 Hydrick Street, Spartanburg, SC 29306. Students should email the professor to approve an alternate proctoring situation.
5. Blog entries are intended to be an avenue for students to communicate with each other, as well as faculty. Students are encourage to use this tool to share ideas and facilitate discuss about course topics. While students will not be graded on their blog participation, we hope students will see the value in this component of the course and utilize it to enrich their experience.

Grading

Participation as demonstrated through:

Three Activity Essays	60%
Quizzes.....	25%
Final Exam	15%
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Grade Range:

93–100.....	A
90–92.....	A-
87–89.....	B+
83–86.....	B
80–82.....	B-
77–79.....	C+
73–76.....	C
70–72.....	C-
Below 70	F

Course Topics

The topics of this course are arranged by content. While students are expected to have prior knowledge of these specific topics, they will be reviewed on the DVDs and embedded in the pedagogy components of each module.

Module #1 - Functions, Graphs and Solving Equations

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<ol style="list-style-type: none"> 1. Functions 2. Linear functions and graphs 3. Applied problems 4. Properties of functions from graphs 5. Solving equations graphically 6. Solving equations algebraically 7. Composition of functions 8. Inverse functions 9. Quadratic functions 10. Polynomial functions of higher degree 11. Real zeros of polynomials 12. Fundamental theorem of algebra 	<p>Required</p> <ol style="list-style-type: none"> 1. Brumbaugh and Rock, Read chapters 1 and 2 2. <i>Navigating Through Mathematical Connections</i>, pp. vii–19 read and complete activities 3. Overview of NCTM Standards for Grades 9–12, http://standards.nctm.org/document/chapter7/index.htm 4. Activity #1: Group Test Activity 5. Recommended (but not required): DVD Refresher Content PreCalculus Unit I 6. Content Practice Problems: on website 7. Complete Quiz #1

NOTE: You must submit your Activity Essay for activity #1 and take quiz #1 BEFORE you can start Module #2.

Module #2 - Exponential, Logarithmic and Rational Functions

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<ol style="list-style-type: none"> 1. Exponential functions 2. Logarithmic functions 3. Solving log and exponential equations algebraically 4. Solving log and exponential equations graphically 5. Applications 6. Asymptotes (rational functions) 7. Graphing rational functions 8. Partial fraction decomposition 	<p>Required</p> <ol style="list-style-type: none"> 1. Brumbaugh and Rock, Read chapters 4 and 6 2. <i>Navigating Through Mathematical Connections</i>, pp. 20–26 read and complete activities 3. Activity #2: Enveloping Functions Activity 4. Recommended (but not required): DVD Refresher Content Pre-Calculus Unit II

	<p>5. Content Practice Problems: on website</p> <p>6. Complete Quiz #2</p>
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NOTE: You must submit your Activity Essay for activity #2 and take quiz #2 BEFORE you can start Module #3.

Module #3 - Trigonometric Functions

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<ol style="list-style-type: none"> 1. Measuring angles 2. Trig functions (right triangle definition) 3. Trig functions (unit circle definition) 4. Evaluating trig functions 5. Graphing trig functions 6. Inverse trig functions 7. Trig identities 8. Trig formulas 9. Solving trig equations 	<p>Required</p> <ol style="list-style-type: none"> 1. Brumbaugh and Rock, Read chapters 7 and 13 2. <i>Navigating Through Number and Operations</i>, pp. vii–11, 23–26, 43–51, 55–59 Read and complete activities 3. Activity#3: Ferris Wheel Activity 4. Recommended (but not required): DVD Refresher Content Pre-Calculus Unit III 5. Content Practice Problems: on website 6. Complete Quiz #3

NOTE: You must submit your Activity Essay for activity #3 and take quiz #3 BEFORE you can start Module #4.

Module #4 - More on Trig, Parametrics, Conics, Polar Equations

List of Topics	Complete the following assignments in sequential order. All prior material will be covered on the quiz.
<ol style="list-style-type: none"> 1. Laws of sines and cosines 2. Vectors 3. Complex numbers and nth roots 4. Parametric equations 5. Graphing parametric equations 6. Conic sections 7. Polar coordinates 8. Graphs of polar equations 	<p>Required</p> <ol style="list-style-type: none"> 1. Brumbaugh and Rock, Read chapters 5 and 8. 2. <i>Navigating Through Number and Operations</i>, pp. 33–37 Read and complete activities 3. Recommended (but not required): DVD Refresher Content Pre-Calculus Unit IV 4. Content Practice Problems: on website 5. Complete Quiz #4