

General Education Course Inclusion Proposal

Quantitative Reasoning and Analysis

Course Name and Number: MA115 Precalculus

Home Department: Mathematics & Computer Science

Department Chair Name and Contact Information: J.D. Phillips, 227-2020, jophilli@nmu.edu

Expected frequency of Offering of the course: every semester

Official Course Status: Has this course been approved by CUP and Senate? YES

Overview of course

A. Overview of the course content

This course contains a brief review of college algebra and an introduction to the basic functions that are studied in a calculus course (polynomial, rational, exponential and logarithmic and trigonometric). This introduction provides students with the ability to transform, combine, graph and solve equations involving these functions as well as develop and apply mathematical models of natural phenomena using these functions.

B. Explain why this course satisfies the Component specified and significantly addresses both learning outcomes

Critical Thinking Learning Outcomes:

- Evidence: Students are asked to solve many 'story' problems. From each story the student must assess the given information and then decide which pieces of information should be used to form a solution.
- Integrate: The exams consist of many multi-step problems. Insight gained in early steps must be integrated with well-known equations and principles to solve the problems.
- Evaluate: Students must evaluate whether the solution they found is the actual solution, not an artifact of their solution method.

Quantitative Reasoning and Analysis Learning Outcomes:

- Calculation: 90% or more of exam and homework problems require a mathematical calculation.
- Analysis/Application: At each stage in the process of problem-solving the student needs to analyze the current state of the data at hand to move to a new step in the process. This is true for virtually all problems given on the exams.
- Interpretation: Many problems require students to interpret a mathematical equation or graph as a model of some natural phenomena.

C. Describe the target audience (level, student groups, etc.)

MA115 is a 100-level course that is a prerequisite for calculus and therefore required by many STEM majors.

D. Give information on other roles this course may serve (e.g. University Requirement, required for a major(s), etc.)

MA 115 is a prerequisite for calculus, which is required for mathematics, secondary education mathematics, computer science, physics, and chemistry majors (among others). It counts as an elective for many other majors. MA 115 will also satisfy the new mathematics competency requirement.

E. Provide any other information that may be relevant to the review of the course by GEC

PLAN FOR LEARNING OUTCOMES
CRITICAL THINKING

Attainment of the CRITICAL THINKING Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Critical Thinking Rubric for more information on student performance/proficiency in this area. Note that courses are expected to meaningfully address all dimensions of the learning outcome.

DIMENSION	WHAT IS BEING ASSESSED	PLAN FOR ASSESSMENT
Evidence	Assesses quality of information that may be integrated into an argument	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 70% & 100% for the exams, roughly 30% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring students to select from given information to arrive at a solution will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Integrate	Integrates insight and or reasoning with existing understanding to reach informed conclusions and/or understanding	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 70% & 100% for the exams, at least 60% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring students to select from a variety of known methods to arrive at a solution will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Evaluate	Evaluates information, ideas, and activities according to established principles	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at

	<p>and guidelines</p>	<p>the end of the semester.</p> <ul style="list-style-type: none"> ❖ Overall Grading Weight: Between 70% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring students either to identify a solution from several possible answers produced during the solution process or to recognize and coherently express the final answer will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
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**PLAN FOR LEARNING OUTCOMES
QUANTITATIVE REASONING AND ANALYSIS**

Attainment of the QUANTITATIVE REASONING AND ANALYSIS Learning Outcome is required for courses in this component. There are several dimensions to this learning outcome. Please complete the following Plan for Assessment with information regarding course assignments (type, frequency, importance) that will be used by the department to assess the attainment of students in each of the dimensions of the learning outcome. Type refers to the types of assignments used for assessment such as written work, presentations, etc. Frequency refers to the number of assignments included such as a single paper or multiple papers. Importance refers to the relative emphasis or weight of the assignment to the entire course. For each dimension, please specify the expected success rate for students completing the course that meet the proficiency level and explain your reasoning. Please refer to the Rubric for more information on student performance/proficiency in this learning outcome. Note that courses are expected to meaningfully address all dimensions of the learning outcome.

DIMENSION	WHAT IS BEING ASSESSED	PLAN FOR ASSESSMENT
Calculation	Ability to perform mathematical/numerical operations.	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 70% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring mathematical calculation will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
Analysis/Application	<p>Ability to manipulate quantitative data to produce new data.</p> <p>Ability to use data to make judgments and draw conclusions.</p>	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final exam at the end of the semester. ❖ Overall Grading Weight: Between 70% & 100% for the exams, at least 90% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring multiple steps / stages will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems.
Interpretation	Ability to explain information presented in mathematical forms (e.g. equations, graphs,	<ul style="list-style-type: none"> ❖ Task type: 3 or more in-class exams / quizzes and a comprehensive final exam ❖ Frequency: in-class exams / quizzes roughly equally spaced throughout the semester, with the comprehensive final

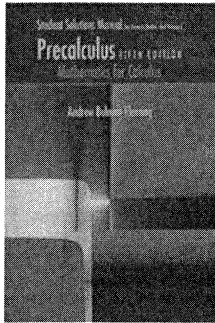
	<p>diagrams, tables, and words)</p>	<p>exam at the end of the semester.</p> <ul style="list-style-type: none"> ❖ Overall Grading Weight: Between 70% & 100% for the exams, at least 50% of this grade involves problems that would address this learning objective ❖ Assessment: Problems requiring students to use equations and / or inequalities to model situations will be embedded in the final exam and scored independently and tracked from semester to semester for assessment purposes. ❖ Expected Proficiency Rate: We expect 70% of students to earn 70% or higher on the assessment problems
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Math 115 :: Syllabus :: Winter 2015

This is the **syllabus** for Precalculus classes Math 115-01 and Math 115-02. Here you'll find information on prerequisites, grading policy, homework, study resources and a tentative course schedule. See the box in the upper right for more links and information for the course.

Textbook

The (required) textbook we will use for this course is **Precalculus - Mathematics for Calculus** by J. Stewart, L. Redlin, and S. Watson. I will use the Fifth Edition, which is available at the University Bookstore. It is pictured below along with a link to places to buy it on the web. Other editions will be very similar, but the exercises will occasionally differ. If you have a different edition, find a friend with the fifth edition to make sure the exercises you work match your friend's. This is an excellent, if lengthy, text and is carefully written with clear explanations. It motivates well the subject and has lots of examples. Try to get the fifth edition as 20% of the exercises in this edition or new.



Classroom

Class will be held, unless otherwise noted, at the following days & times.

- Math 115-01 :: JXJ 3100 :: 10:00 - 10:50 am :: MWTF
- Math 115-02 :: WEST 1705 :: 1:00 - 1:50 pm :: MWTF

Your daily attendance is required. I will record attendance and you are expected to come to class daily, to be fully awake, to pay attention to and participate in the class discussion. I will do my part to make class something you look forward to rather than dread.

Office Hours

I am often in my office **JXJ 2226**, you are free to stop by and see if I am available. My official office hours are :

- Monday: 2pm - 3pm
- Wednesday: 2pm - 3pm
- Thursday: 11am - 12am, 2pm - 3pm
- Friday: 2pm - 3pm

Grading

- Homework 25%
- Team Quizzes 5%
- Exams 45% (4 @ 11.25% each)
- Final 25%

WeBWork

Homework will be administered via WeBWork, and is due each Monday at 8am. Any additional written homework will be turned in on Thursday. Learn how to use WeBWork immediately! Help can be found [here](#).

Quizzes

Unannounced *team* quizzes will be given on occasion.

Exams

- Exam 1 - January 30
- Exam 2 - February 27
- Exam 3 - March 27
- Exam 4 - April 17
- Final - (MA115-01) Tuesday, April 28, 10am - 11:50am
- Final - (MA115-02) Wednesday, April 29, 12pm - 1:50pm
- *We follow NMU's Final Exam Schedule. Make sure that you will be able to attend the exams at the given dates and times. Exceptions can only be accepted in case of time conflicts with other courses, or serious illness with a physician's certification.*

Prerequisites

You need either:

- C- or better in MA111
- B- or better in MA 104
- a satisfactory score on the Math Placement Exam.

Calculators

Calculators and graphing software will often be used in class and will be allowed on **Some** exams and quizzes. Unless otherwise notified, you are **not allowed to**

have any information saved in your calculators during quizzes and exams. You are not required to have a calculator: there are many free online graphing calculators available. [FooPlot.com, DesMos.com]

Laptops & Phones

Do not use your laptop, phone or electronic media device in class unless instructed to do so.

Other Resources

There is an dizzying array of supporting materials for this textbook in particular, but many cost money. The link on the right College Algebra Resources contains links to mostly free sites & documents that will help you get off on the right foot. Both free and paid tutoring is available, in the tutoring lab in NSF 3810.

Here's the [Tutor Lab Schedule](#)

Outcomes & Assessment

Upon successful completion of this course students will be able to:

- Manipulate mathematical expressions.
- Apply mathematical models to solve contextualized problems.
- Recognize and analyze the natural functions and their properties.
- Construct graphs of functions and interpret the results.

Evaluation of these learning outcomes will be done through a mix of assignments, class exercises, projects, research papers, group work, written & oral quizzes and tests.

Course Description

The first two weeks of the course we will learn some fundamental concepts and how they are used. It is **very** important to get a firm grasp on the fundamentals. We will cover the first 7 chapters of the textbook.

Chapter 1 :: Fundamentals :: Weeks 1 & 2

- Real numbers: From small to large, they are used model to world.
- Algebraic expressions: Like a phrase in English, they convey a controlled sense of the unknown.
- Coordinate geometry: Like a *GPS*.
- Modeling using equations: How science gets done.

Chapter 2 :: Functions :: Weeks 3 & 4

- Dynamics: Functions are a way of expressing dependence between two distinct things.
- Qualitative behavior: Functions can be compared and transformed into one another.
- Visualizing Functions: We can **see** the effect of functions.

Chapter 3 :: What kind of functions are there? :: Weeks 5 & 6

- Polynomial: Basic building block functions, easy to describe and useful to use..
- Rational: Ratios of polynial functions.
- Exponential: How money grows, decay happens and learning occurs.
- Logarithmic: Explosion followed by bounded growth.

Chapter 4 :: Exponential & Logarithmic Functions :: Weeks 9 & 10

- Exponentials: We will learn how the exponential and logarithmic functions relate.
- Logarithms: We will demonstrate the algebraic properties of these functions.
- Laws of Logs: We will collect these algebraic properties into formal laws.
- Modeling: We will describe natural phenomena in terms of these functions.

Chapter 5 :: Trig Functions of Real Numbers :: Weeks 11 & 12

- Unit Circle Love: The ferris wheel of math.
- Trig Functions of real numbers: What note is that violin playing?
- Trig graphs: Graphs of trig functions will help us understand the seasons.

Chapter 6 :: Trig Functions of Angles :: Weeks 13 & 14

- Angle Measure: What does bicycling have to do with angle measure?
- Right Angle Trig: How tall is that builing and how high is that tree?
- Trigonometric functions of angles: How fast can we sled down that hill?

Chapter 7 :: Analytic Trigonometry :: Weeks 13 & 14

- Trig Identities & Formulae: Tricks to figure out where to sit at the Movies.
- Problem Solving: What trig has to do with the waves of Lake Superior.

Natural Sciences Requirement

This course satisfies the Foundation of Natural Sciences/Mathematics requirement. Students who complete this course should be able to demonstrate a basic understanding of mathematical logic; use mathematics to solve scientific or mathematical problems in college classes; express relationships in the symbolic language of mathematics; and appreciate the role of mathematics in analyzing natural phenomena.

University Policies

Academic Honesty: Cheating is not only unethical and pathetic, but is a violation of the Northern Michigan University Student Code and University Policy and grounds for your dismissal from the University.

Discrimination & Harassment: Northern Michigan University does not unlawfully discriminate on the basis of race, color, religion, national origin, gender, age, height, weight, marital status, handicap/disability, sexual orientation or veteran status. If you have a civil rights inquiry, contact the Affirmative Action Office at 906-227-2420.

Americans with Disabilities Act Statement: The University seeks to provide equal access to its programs, services and activities for people with disabilities. If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 2001 C. B. Hedgcock Building (227-1700). at 906-227-1700 as soon as possible. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

The Registrar: Withdrawing from any course or any matters relating to registration are the responsibility of the student. For more information regarding this topic, check out the Registrars Website.

Links for Math 115

- [MA115 Homepage](#)
- [Some Fundamental Facts](#)
- [College Algebra Resources](#)

Other Links

- [MyWeb](#)
- [MyNMU](#)
- [EduCat](#)
- [NMU Math](#)
- [NMU Home](#)
- [Teaching](#)
- [Research](#)
- [Professor Bio](#)
- [Professor Home](#)
- [Important Dates](#)
- [Math in the Media](#)
- [Course Information](#)
- [My Teaching Statement](#)
- [Courses Previously Taught](#)