

Pre-Calculus

MAT-1200

2022 07/01/2022 to 06/30/2023 Modified 04/22/2022

Course Description

Pre-Calculus will begin with a review of essential algebraic concepts such as exponents, radicals, polynomials, factoring, and complex numbers. The student will then study material related to trigonometric identities, systems of equations and matrices, and graphing everything from linear and quadratic functions to vectors and polar coordinates. Concepts such as absolute value, synthetic division, and radical expressions will be coupled with real applications of trigonometric functions, combinations and probability. As the material is presented through video lectures and illustrations, the student will be given opportunity to practice learned skills and explore topics such as limits, differentiation and integration.

Rationale

Pre-Calculus takes the student beyond the rigors of Geometry and Algebra 2 to new uses of math principles. It is important for students to learn how basic quadratics and functions can produce more complicated mathematical operations and calculations. By exploring uses of sines and cosines, practical applications involving vectors and matrices can be used to make math a tool for solving problems beyond simple four operation calculations.

Prerequisite

Algebra II and Geometry

Measurable Learning Outcomes

- A. The student will review basic principles of algebra including exponents, factoring and solving algebraic equations.
- B. The student will practice using algebraic principles to graph and solve problems involving points on the coordinate plane.
- C. The student will find the solution sets for inverse functions, explore operations with complex numbers, and use exponential models and natural exponential functions.
- D. The student will further study properties of logarithms and solve exponential and logarithmic equations using a variety of methods.
- E. The student will explore the attributes and equations of conic sections and use proven algebraic principles to solve and graph conic sections.
- F. The student will use trigonometric functions to solve problems across the coordinate plane including sines, cosines, tangents, cotangents, secants and cosecants.
- G. The student will be introduced to a variety of trig identities and apply them in solving trigonometric problems including sums, differences, double and half angle formulas.
- H. The student will explore and use the law of sines and the law of cosines, vectors and complex numbers, and solve systems of linear equations.
- I. The student will investigate determinants, inverses of matrices, polar coordinates, and solve problems using principles of arithmetic and geometric sequences.
- J. The student will calculate probability using the fundamental counting principle, permutations and combinations.

Course Resources

See LUOA's [Systems Requirements](#) for computer specifications necessary to operate LUOA curriculum. Also view [Digital Literacy Requirements](#) for LUOA's expectation of users' digital literacy.

This course makes use of third-party digital resources to enhance the learning experience. LUOA staff and faculty have curated these resources. Students can safely access them to complete coursework. Please ensure that internet browser settings, pop-up blockers, and other filtering tools allow for these resources to be accessed. See Technologies and Resources Used in this Course below for a specific list.

- Note: Embedded YouTube videos may be utilized to supplement LUOA YouTube videos are the property of the respective content creator, licensed to YouTube for distribution and user access. As a non-profit educational institution, LUOA is able to use YouTube video content under the YouTube Terms of Service. For additional information on copyright, please contact the [Jerry Falwell Library](#).

Scripture Attribution

- Grades 7-12: All Scripture quotations, unless otherwise indicated, are from the ESV® Bible (The Holy Bible, English Standard Version®), copyright © 2001 by Crossway, a publishing ministry of Good News Publishers. Used by permission. All rights reserved. May not copy or download more than 500 consecutive verses of the ESV Bible or more than one half of any book of the ESV Bible.

Technologies and Resources Used in this Course

The following resource(s) are used throughout this course:

- Thinkwell

Policies

Students are accountable for all information in the [Student Handbook \(https://www.liberty.edu/online-academy/wp-content/uploads/2021/11/LUOA-Student-Handbook.pdf\)](https://www.liberty.edu/online-academy/wp-content/uploads/2021/11/LUOA-Student-Handbook.pdf). Below are a few policies that have been highlighted from the Student Handbook.

Course Grading Policies

The student's grades will be determined according to the following grading scale and assignment weights. The final letter grade for the course is determined by a 10-point scale. Assignments are weighted according to a tier system, which can be referenced on the Grades page in Canvas. Each tier is weighted according to the table below. Items that do not affect the student's grade are found in Tier 0.

Grading Scale	Assignment Weights
A 90-100%	Tier 0 0%
B 80-89%	Tier 1 25%
C 70-79%	Tier 2 35%
D 60-69%	Tier 3 40%
F 0-59%	

In order for students to receive credit for a course, the following conditions have to be met:

- All semester exams and module tests have to be completed.
- All Tier 3 projects or papers have to be completed.
- Fewer than 10 zeros exist in the gradebook for blank submissions in a full credit course and 5 zeros for blank submissions in

a semester course.

Types of Assessments

To simplify and clearly identify which policies apply to which assessment, each assessment has been categorized into one of four categories: Lesson, Assignment, Quiz, or Test. Each applicable item on the course Modules page has been designated with an identifier chosen from among these categories. Thus, a Quiz on the American Revolution may be designated by the title, “1.2.W - Quiz: The American Revolution.” These identifiers were placed on the Modules page to help students understand which Resubmission and Honor Code policies apply to that assessment (see the Resubmission Policy and Honor Code Policy below for further details).

- **Lesson:** *Any item on the Modules page designated as a “Lesson”*

These include instructional content and sometimes an assessment of that content. Typically, a Lesson will be the day-to-day work that a student completes.

- **Assignment:** *Any item on the Modules page designated as an “Assignment”*

Typical examples of Assignments include, but are not limited to, papers, book reports, projects, labs, and speeches. Assignments are usually something that the student should do his or her best work on the first time.

- **Quiz:** *Any item on the Modules page designated as a “Quiz”*

This usually takes the form of a traditional assessment where the student will answer questions to demonstrate knowledge of the subject. Quizzes cover a smaller amount of material than Tests.

- **Test:** *Any item on the Modules page designated as a “Test”*

This usually takes the form of a traditional assessment where the student will answer questions to demonstrate knowledge of the subject. Tests cover a larger amount of material than Quizzes.

Resubmission Policy

Students are expected to submit their best work on the first submission for every Lesson, Assignment, Quiz, and Test. However, resubmissions may be permitted in the following circumstances:

- **Lesson:** Students are automatically permitted two attempts on a Lesson. Students may freely resubmit for their first two attempts without the need for teacher approval.
- **Assignment:** Students should do their best work the first time on all Assignments. However, any resubmissions must be completed before the student moves more than one module ahead of that Assignment. For example, a student may resubmit an Assignment from Module 3 while in Module 4, but not an Assignment from Modules 1 or 2. High School students may not resubmit an Assignment without expressed written permission from the teacher in a comment.
- **Quiz:** Students may NOT resubmit for an increased grade.
- **Test:** Students may NOT resubmit for an increased grade.

If a student feels that he or she deserves a resubmission on a Lesson, Assignment, Quiz, or Test due to a technical issue such as a computer malfunction, the student should message his or her teacher to make the request.

Honor Code Policy

Every time a student violates the Honor Code, the teacher will submit an Honor Code Incident Report. The Student Support Coordinator will review the incident and allocate the appropriate consequences. Consequences, which are determined by the number of student offenses, are outlined below:

- **Warning:** This ONLY applies to high school Lessons and elementary/middle school Assignments and Lessons. Students should view these actions as learning opportunities.
 - **Lessons:** A zero will be assigned for the question only.
 - **Elementary/Middle School Assignment:** The student must redo his or her work; however, the student may retain his or her original grade.
- **1st Offense:**

- **Lesson, Quiz, or Test:** The student will receive a 0% on the entire assessment.
- **Assignment:** The student will either:
 - Receive a 0% on the original assignment
 - Complete the Plagiarism Workshop
 - Retry the assignment for a maximum grade of 80%
- **2nd Offense:** The student will receive a 0% and be placed on academic probation.
- **3rd Offense:** The student will receive a 0% and the Director of Faculty will determine the consequences that should follow, possibly including withdrawal from the course or expulsion from the academy.

Materials Selection Policy

LUOA curates educational materials that are consistent with the school's philosophy; however, the fallen human condition depicted in literature (as in Scripture itself) is not always pleasant. Valuable works sometimes have objectionable or profane elements. Good books provide four (4) recognized values.

- They build godly attitudes and character traits.
- They deepen our social and cultural awareness.
- They strengthen our use of written language.
- They provide a lifelong source of enjoyment and relaxation.

In order to instill these values in students and fulfill the stated objectives of the school, all LUOA students are expected to read and study good books on a regular basis. Recognizing that materials designed for one level may not be appropriate for another, three (3) levels of criteria are applied:

- Elementary materials must contain no objectionable material,
- Objectionable elements in sixth through eighth-grade materials must be limited and must serve a specific educational purpose, and
- Objectionable content may be included in high school materials but must be outweighed by positive literary, curricular, and/or Christian values.

The curriculum department has approved required educational materials for students.

Schedule

Module 1: Prerequisites

Week 1: Basic Algebra Review

Week 2: Rational Exponents, Radicals and Polynomials

Week 3: Factoring and Rational Expressions

Week 4: Solving Equations and Complex Numbers

Module 2: Relations and Functions

Week 5: Coordinates, Intercepts, and Circles

Week 6: Slope and Equations of Lines

Week 7: Functions and Graphs of Functions

Week 8: Transformations and Combinations of Functions

Week 9: Module 2 and Quarter 1 Assessments

Module 3: Polynomial Functions

Week 10: Inverse and Quadratic Functions

Week 11: Polynomial Functions

Week 12: Zeros and The Fundamental Theorem of Algebra

Week 13: Exponential Functions

Module 4: Exponential and Logarithmic Functions

Week 14: Logarithmic Functions

Week 15: Properties of Logarithms, Solving Exponential and Logarithmic Equations

Week 16: Exponential and Logarithmic Models

Week 17: Rational Functions and Conics

Week 18: Module 4 and Quarter 2 Assessments

Module 5: The Trigonometric Functions

Week 19: Angles and Their Measure and Right Triangle Trigonometry

Week 20: Trigonometric Functions in the Coordinate Plane and Unit Circle Trigonometry

Week 21: Graphing Sine and Cosine Functions

Week 22: Graphing Other Trigonometric Functions and Module 5 Assessment

Module 6: More with Trigonometric Functions

Week 23: Inverse Trigonometric Functions and Applications of Trigonometric Functions

Week 24: Fundamental Trigonometric Identities

Week 25: Solving Trigonometric Equations

Week 26: Trigonometric Formulas

Week 27: Module 6 and Quarter 3 Assessments

Module 7: Applications of Trigonometry and Systems of Equations

Week 28: The Law of Sines and The Law of Cosines

Week 29: Vectors and Complex Numbers

Week 30: Solving Systems of Linear Equations

Week 31: Matrices, Systems of Equations, and Module 7 Assessment

Module 8: Additional Topics

Week 32: Determinants and Inverses of Matrices

Week 33: Analytic Geometry

Week 34: Sequences and Series, Arithmetic Sequences

Week 35: Geometric Sequences, Induction, and Probability

Week 36: Module 8 and Quarter 4 Assessments