

Term Information

Effective Term Autumn 2019

General Information

Course Bulletin Listing/Subject Area Mathematics
Fiscal Unit/Academic Org Mathematics - D0671
College/Academic Group Arts and Sciences
Level/Career Undergraduate
Course Number/Catalog 1120
Course Title Precalculus with Review I
Transcript Abbreviation Precal with Rev I
Course Description This is the first course of a two course sequence covering precalculus. In this first course, topics covered will include an introduction to functions (linear, polynomial and rational), equations and inequalities along with appropriate review. This course is designed with an emphasis on reviewing these fundamental basic algebra skills as they apply to precalculus in a just-in-time manner.
Semester Credit Hours/Units Fixed: 5

Offering Information

Length Of Course 14 Week, 12 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Recitation, Lecture
Grade Roster Component Recitation
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites A grade of C- or better in Math 075; or grade of B- or better in Math 1050; or Math Placement level R.
Exclusions Not open to students with credit for Math 1121 or above, or 148 or above.
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 27.0101
Subsidy Level Baccalaureate Course
Intended Rank Freshman

Requirement/Elective Designation

General Education course:

Mathematical or Logical Analysis

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Demonstrate a thorough understanding of precalculus concepts both graphically and analytically
- Demonstrate a conceptual understanding and computational proficiency of elementary functions (linear, polynomial and rational)
- Demonstrate relevant applications of mathematical principles by modeling problems arising in a variety of disciplines using precalculus concepts and analyzing their solutions

Content Topic List

- Inequalities and absolute values
- Functions and relations
- Linear, polynomial and rational functions
- Systems of linear equations
- Transformations and analysis of graphs
- Algebra of functions
- Zeros and division of polynomials
- Polynomial and rational inequalities

Sought Concurrence

No

Attachments

- Precalculus with Review Sequence.docx: Course Rationale
(Other Supporting Documentation. Owner: Husen, William J)
- 1120_syllabus.docx: Syllabus
(Syllabus. Owner: Husen, William J)
- 1120_weekly_topics.docx: Weekly topics
(Other Supporting Documentation. Owner: Husen, William J)
- Math 1120 GE Assessment.docx: GE Assessment
(GEC Course Assessment Plan. Owner: Husen, William J)
- Math 1120 GE Rationale.docx: GE Rationale
(Other Supporting Documentation. Owner: Husen, William J)
- deadline_appeal_1120_1_15_2019.pdf: Deadline appeal
(Appeal. Owner: Husen, William J)

Comments

COURSE REQUEST
1120 - Status: PENDING

Last Updated: Haddad,Deborah Moore
02/15/2019

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Husen,William J	02/15/2019 12:56 PM	Submitted for Approval
Approved	Husen,William J	02/15/2019 01:08 PM	Unit Approval
Approved	Haddad,Deborah Moore	02/15/2019 04:24 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Oldroyd,Shelby Quinn Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler	02/15/2019 04:24 PM	ASCCAO Approval

Precalculus with Review I

Math 1120

Syllabus

COURSE DESCRIPTION: This is the first course of a two semester course sequence covering precalculus. In this first course, topics covered will include an introduction to functions (linear, polynomial and rational), equations and inequalities along with appropriate review. In most traditional precalculus courses, many students struggle with important basic algebra concepts. Precalculus with Review I is designed with an emphasis on reviewing these fundamental basic algebra skills as they apply to precalculus in a just-in-time manner. At the end of the course sequence, students will take a comprehensive final exam covering the material from both this course and the subsequent course. The material from this first course will be revisited throughout the second course.

CREDIT HOURS: 5

COURSE PREREQUISITES: A grade of C- or better in Math 075; or grade of B- or better in Math 1050; or Math Placement level R. Not open to students with credit for Math 1121 or above, or 148 or above.

INSTRUCTOR INFORMATION:

TEXTBOOK: J. Miller, D. Gerken. College Algebra & Trigonometry. 1st Edition, McGraw-Hill.

ISBN for Loose-leaf version with ConnectMath Access Code: 978-1259976612

ELECTRONIC OPTION FOR TEXTBOOK: All students are required to have an access code for the ConnectMath Homework System that is used with the course. This online homework/study system includes a (searchable) electronic version of the textbook. New versions of the textbook bought in the campus bookstore come with a student access code.

TECHNOLOGY: All students are **required** to have an access code for the ConnectMath Homework System and are **required** to have a graphing calculator for this course. It is recommended that you use a TI-83, TI-83 plus, or a TI-84. **Note that the TI-89, TI-92, and calculators that use a Computer Algebra System are not permitted.**

E-MAIL, HOMEPAGE & CARMEN: You are responsible for information contained in e-mail messages sent to your official OSU e-mail address: **yourlastname.#@osu.edu**. You should check your e-mail at least once per day. Additional course information can be found on the course homepage at <https://math.osu.edu/courses/1120>. Carmen is a web-based course tool that allows you to view course materials and your scores. You can access Carmen by visiting <http://carmen.osu.edu>. You will need your OSU ID and password.

RECITATION: You will meet with your recitation instructor on Tuesdays and Thursdays. Your performance in recitation will count for a total of **15%** of your grade:

- **HOMEWORK:** Homework consists of 13 online homework assignments (graded) and additional offline assignments (ungraded) from the course textbook. Access information for online homework will be available from your lecturer by the second day of lecture. ***Students are responsible for completing online homework before it falls due – the online homework system does not accept homework that is overdue.*** The ten best homework assignments will be counted, in total, for an overall total of **5%** of your grade.
- **QUIZZES:** There will a total of 10 quizzes given by your recitation teacher during the semester. The seven best quiz scores will be counted, in total, for an overall total of **10%** of your grade. **There will be no make-up of quizzes; if you miss a quiz that will be one of your three dropped scores.**

Please note that both the textbook and online homework will form the basis for quizzes and exams; however, exam questions may differ from homework and quiz questions. Also, exams will cover conceptual ideas along with computational problems.

EXAMS: There will be three midterm exams and a **cumulative and comprehensive final exam** given. The midterms, in total, will count for **50%** of your grade and the final exam will count for **35%** of your grade.

- **MAKE-UPS:** You must have **written permission** from your lecturer to take a make-up exam. See your lecturer for the time and location of a make-up exam. Please note that **no early exams** will be given.

COURSE GRADE: Your final grade will be based on your online homework, quiz, midterm, and final exam scores. The percentages for each are given below.

Total Percentages:

RECITATION 15% (Best 7 of 10 quizzes and best 10 of 13 online homework scores)

MIDTERMS: 50% (3 midterms)

FINAL EXAM: 35%

TOTAL: 100%

GRADING SCALE (Percent) (Adjustments to this scale may be made at the end of the semester):

A	A-	B+	B	B-	C+	C	C-	D+	D
90	87	83	80	77	73	70	67	63	60

HELP WITH THE COURSE: Your lecturer and recitation instructor will have regular office hours for individual help. The Mathematics and Statistics Learning Center (MSLC) offers free tutoring and is available for additional course help. More information on the MSLC can be found at: <https://mslc.osu.edu>

TECHNOLOGY PROBLEMS:

It is inevitable that technology will sometimes malfunction. Students are responsible for beginning assignments early enough to have time to ask for help with technical issues. Although reasonable accommodations for students when there are technical issues, the student will be responsible for documenting errors and seeking help in a timely fashion from both technical support and the instructor as needed. No accommodations will be made for students who do not work actively to resolve their technical problems in a timely fashion.

STUDENT PARTICIPATION EXPECTATIONS:

You are expected to check Carmen at least once every 24 hours on weekdays. You should plan on working on this course every school day. There are frequent deadlines in this course, and students are expected to keep track of all deadlines. Students are expected to work ahead of those deadlines whenever possible to prevent last-minute problems. Students are expected to attend all recitation meetings.

DISABILITY SERVICES STATEMENT:

“Students with disabilities that have been certified by Student Life Disabilities Services (SLDS) will be appropriately accommodated and should inform the instructor as soon as possible of their needs. SLDS contact information: WWW: <http://www.ods.ohio-state.edu/>;

E-mail: slds@osu.edu; Phone: 614-292-3307; VRS: 614-429-1334;

Address: 098 Baker Hall, 113 W. 12th Avenue.

GE INFORMATION: This Mathematics course can be used, depending on your degree program, to satisfy the *Quantitative Reasoning: Mathematical or Logical Analysis* category of the General Education Requirement (GE). The goals and expected learning outcomes for this category are:

Goals:

Students develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models.

Expected Learning Outcomes:

1. Students comprehend mathematical concepts and methods adequate to construct valid arguments.
2. Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning
3. Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

COURSE LEARNING OBJECTIVES: This is the first course of a two-semester sequence. Upon successful completion of this sequence, students will be able to:

1. Demonstrate a thorough understanding of precalculus concepts both graphically and analytically.
2. Demonstrate a conceptual understanding and computational proficiency of elementary functions.
3. To demonstrate relevant applications of mathematical principles by modelling problems arising in a variety of disciplines using precalculus concepts and analyzing their solutions.

ACADEMIC MISCONDUCT STATEMENT: "It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-48.7). For additional information, see the Code of Student Conduct at <http://studentlife.osu.edu/csc/>."

Precalculus with Review I
Math 1120
Weekly Topics

Week 1: Inequalities and Absolute Values

Week 2: Functions and relations

Week 3: Linear Functions

Week 4: Applications of Linear Functions

Exam 1

Week 5: Systems of Linear Equations in Two Variables

Week 6: Systems of Linear Equations in Three Variables

Week 7: Transformations of Graphs

Week 8: Analyzing Graphs of Functions

Week 9: Algebra and Composition of Functions

Exam 2

Week 10: Quadratic Functions

Week 11: Introduction to Polynomial Functions

Week 12: Division of Polynomials and The Remainder and Factor Theorems

Week 13: Zeros of Polynomials

Week 14: Rational Functions

Exam 3

Week 15: Polynomial and Rational Inequalities

Comprehensive Final Exam

Precalculus with Review Sequence Rationale

The Ohio State University offers several math courses that are credit bearing and serve as gateway math courses. Currently, successful completion of Math 1050 and Math 1075 (or a demonstration of comparable knowledge) are required for enrollment into these gateway courses. Moreover, given the general education requirements at OSU, nearly all students must successfully complete a gateway math course. As such, Math 1050 and Math 1075, both remedial courses, are potentially serious stumbling blocks to students as they progress through their chosen degree program, especially for students intending a STEM major. Students can become “trapped” in these remedial courses, requiring several attempts to pass, if they do manage to pass. One of the biggest hurdles to overcome is that the vast majority of students have previously studied the material in these courses but have not successfully completed or retained knowledge of this material. Additionally, fundamental component of good pedagogy is to make sure that students continue to move forward in acquiring knowledge, and this is something that the Department of Mathematics will promote.

The Ohio Mathematics Initiative (OMI) serves as a backdrop to the development of the course sequence in this submission. The OMI started in the Spring of 2013 and has served as a template and an motivator for co-requisite remediation and the defining of mathematical pathways that are most appropriate for various degree programs. The research behind the various OMI proposals has shown that both co-requisite remediation and appropriate math pathways led to significantly improved student success, not only in math courses, but in their chosen degree programs – success in terms of grades and in terms of retention.

In keeping with research that indicates much better success rates through co-remediation, the *Precalculus with Review* sequence is two course sequence equivalent to Math 1150 (Precalculus) which also includes review material from Math 1075 in a just-in-time format. This sequence, which is sometimes referred to as “stretch precalculus” is a sequence of two 5-credit hour courses that would meet all of the learning outcomes of Math 1150 and therefore serve as a direct prerequisite to calculus. More importantly, this precalculus with review sequence would only have Math 1050 (with a B- or better in this course) as a prerequisite or a suitable Math Placement Exam level (Level R), so students who place into Math 1075 (at level R) can directly take this STEM gateway math sequence rather than take an initial remedial math course. Currently, students are qualified to enroll in Math 1075 if they have a Math Placement Exam level of S in addition to level R. Data has shown that students at the S level of math placement struggle in Math 1075 with fundamentals beyond the scope of that course. These students are generally advised to enter Math 1050 instead of Math 1050.

It should be noted that the Department of Mathematics recently developed a “stretch calculus” sequence (Calculus with Review I & II) which combines calculus with just-in-time remediation from precalculus. This “stretch calculus” has shown a large increase (nearly double) in completion rates for students taking a calculus course compared to those who take a traditional precalculus course and calculus course.

Parallel to the aforementioned Calculus with Review session, the Precalculus with Review session is paced in such a way that a large portion of the just-in-time review takes place during the first course. This allows the students plenty of time to get into the flow of the new material. Equal in importance, the speed of presentation of new material accelerates in the second course, so that by the mid-point of the second course, students are experiencing a course that is similar in flow to Math 1151 (Calculus I). In this way, students are not disadvantaged by taking the Precalculus with Review sequence relative to peers in Math 1150 as related to the follow up Math 1151 course.

Although students who place into Math 1050 are not considered here, such students would be allowed to enter “stretch precalculus” after successfully completing Math 1050 with a B- or better, rather than being required to take Math 1075. Students in Math 1050 who do not meet the B- or better requirement should take the full semester Math 1075 course. It should be mentioned that a mid-term goal is to develop an alternate course for these Math 1050 students, with the idea of this new course feeding into the Precalculus with Review sequence.

Math 1120
GE Rationale Statement

GE Category: Quantitative Reasoning – Mathematical or Logical Analysis

Goals of the Quantitative Reasoning GE Category:

Students develop skills in quantitative literacy and logical reasoning, including the ability to identify valid arguments, and use mathematical models.

Expected Learning Outcomes of the Mathematical of Logical Analysis GE Subcategory:

1. Students comprehend mathematical concepts and methods adequate to construct valid arguments.
2. Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning
3. Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

Currently any math course at the level of Math 1116 or above, excluding Math 1125 and Math 1126 satisfy this GE subcategory. This course, Math 1120, is intended to as well.

1. How do the course objectives address the GE category expected learning outcomes?

The stated learning outcomes for Math 1120 are as follows:

1. Demonstrate a thorough understanding of precalculus concepts both graphically and analytically.
2. Demonstrate a conceptual understanding and computational proficiency of elementary functions.
3. To demonstrate relevant applications of mathematical principles by modelling problems arising in a variety of disciplines using precalculus concepts and analyzing their solutions.

Students who successfully complete Math 1120 will be expected to have acquired these learning outcomes. In particular, as students develop a conceptual understanding of precalculus as well as learning the computational proficiency required, they will be able to comprehend these mathematical concepts and the corresponding methods used to justify their work (i.e. constructing valid arguments). At the core of the precalculus concepts is the idea of functions and the algebra associated with functions. This process requires both inductive and deductive reasoning to understand how this process works and how to apply it to situations. Finally, one of the principal focuses will be working with applied problems. Students are required to demonstrate their abilities to synthesize the precalculus concepts that they have learned and produces solutions to essentially real world problems. In doing so, they will be able to demonstrate the applications of these mathematical concepts to the problems at hand.

2. How do the readings assigned address the GE category expected learning outcomes?

Students are required to read the text before each lecture. Traditionally this is something that is neglected by students and unenforced by instructors. In Math 1120, the text used is has an online homework feature that requires students to “fill-in” various missing text. Students will be required to, in some sense, write part of the textbook themselves – to be done before class. Because of the nature of the material, students will clearly be required to understand the concepts of precalculus and be able to construct parts of the elements of arguments used throughout. Moreover, students are expected to read over sample problems with their solutions. All such problems involve elements of inductive and deductive reasoning. Many of these problems are applied problems and the expectation is that students will rework these problems on their own.

3. How do the topics address the GE category expected learning outcomes?

Math 1120 covers approximately half of the topics in Math 1150 (precalculus). Particularly both an introduction to functions (linear, polynomial and rational) and associated algebra. Students that learn these topics develop a comprehension of mathematical concepts and should be able to construct a valid argument. Moreover, the reasoning required to bridge the various topics something to which the students will be exposed. Finally, aside from being a prerequisite for calculus, another fundamental goal of precalculus is to prepare students for further study in STEM areas. The topics in Math 1120 include applied problems and methods used to solve them. As such students are required to demonstrate their abilities to work through such modeling problems.

4. How do the written assignments address the GE category expected learning outcomes?

Students in Math 1120 will be required to work on a wide variety of problems, ones involving procedural skills, conceptual knowledge and applications. First and foremost, every student is required to justify their answers. This requires the student to be able to formulate a valid argument for a given problem. Moreover, problems involving conceptual ideas (as different from skills) generally require a student to deduce a correct answer from known facts – rather than simply implement an algorithm. Finally, many of the assigned questions are applied questions, including projects that students will be working on. Here students must be able to demonstrate their general problem solving skills in the context of real-world type problems.

**General Education Assessment (Quantitative Reasoning: Mathematical or Logical Analysis)
Math 1120**

<p align="center">GE Expected Learning Outcomes</p>	<p align="center">Methods of Assessment <i>*Direct methods are required. Additional indirect methods are encouraged.</i></p>	<p align="center">Level of student achievement expected for the GE ELO. (for example, define percentage of students achieving a specified level on a scoring rubric)</p>	<p align="center">What is the process that will be used to review the data and potentially change the course to improve student learning of GE ELOs?</p>
<p><u>ELO 1</u></p> <p>Students comprehend mathematical concepts and methods adequate to construct valid arguments.</p>	<p>Direct Method: Embedded questions on final exam</p> <p>Indirect Method: Course evaluation question</p>	<p>At least 75% receiving a 2 or higher on the 4-point grading rubric</p> <p>A mean score of at least 4 on a 5-point scale in student responses to "This course helped me meet this objective"</p>	<p>Results will be shared with instructors, course coordinator and undergraduate committee, which will recommend improvements if appropriate</p>
<p><u>ELO 2</u></p> <p>Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning.</p>	<p>Direct Method: Embedded questions on final exam</p> <p>Indirect Method: Course evaluation question</p>	<p>At least 75% receiving a 2 or higher on the 4-point grading rubric</p> <p>A mean score of at least 4 on a 5-point scale in student responses to "This course helped me meet this objective"</p>	
<p><u>ELO 3</u></p> <p>Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.</p>	<p>Direct Method: Embedded questions on final exam</p> <p>Indirect Method: Course evaluation question</p>	<p>At least 75% receiving a 2 or higher on the 4-point grading rubric</p> <p>A mean score of at least 4 on a 5-point scale in student responses to "This course helped me meet this objective"</p>	

(1.) Direct Method: Embedded Questions on Final Exam

The main assessment for Math 1120 will be in the form of embedded questions on the final exam. These questions will be graded normally and be part of the overall final exam score; however, they will also be separately scored using a Department of Mathematics rubric for the GE. These GE scores will be recorded and used to assess the GE. The level of achievement that is expected is that 75% of the students receive a 2 or higher on this grading rubric.

**Department of Mathematics rubric for assessing GE
(Quantitative Reasoning: Mathematical or Logical Analysis)**

	Capstone (4)	Milestone (3)	Milestone (2)	Benchmark (1)
(ELO 1) Students comprehend mathematical concepts and methods adequate to construct valid arguments.	Student shows superior comprehension of mathematical concepts and methods and is able to construct valid arguments.	Student demonstrates ability to use mathematical concepts and methods to construct a valid argument.	Student comprehends mathematical concepts and is able to construct valid argument.	Student comprehends mathematical concepts and methods at a basic level but is unable to construct valid arguments.
(ELO 2) Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning.	Student demonstrates superior understanding of inductive and deductive reasoning.	Student understands inductive and deductive reasoning.	Student's understanding of inductive and deductive reasoning in limited.	Student is unable to demonstrate ability to use mathematical concepts to understand inductive and deductive reasoning.
(ELO 3) Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.	Student demonstrates sophistication in their use of mathematical methods in their problem solving skills.	Student demonstrates an increase in their ability to integrate mathematical concepts in their problem solving skills.	Some evidence of student's increased problem solving skills is demonstrated.	Student is unable to apply basic mathematical concepts and methods to solve problems.

Examples of Embedded Questions:

ELO 1: Students comprehend mathematical concepts and methods adequate to construct valid arguments.

(1.) Let $f(x) = \sqrt{x}$ and $g(x) = 2\sqrt{5x + 3}$. Find a sequence of transformations which transforms $f(x)$ to $g(x)$

ELO 2: Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning.

(1.) Suppose that f is a continuous function such that $f(2) = 3$ and $f(7) = -4$. Must f have a zero in the interval $(2,7)$? Explain your answer.

ELO 3: Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

(1.) A soccer ball is hit from the ground and lands 20 meters away from where it was hit. Furthermore, it reached a maximum height of 5 meters during its travel. Assuming that the path of the ball is a parabola (ignoring air resistance), find a quadratic function to model the height of the ball when it has traveled x meters horizontally.

(2.) Indirect Method: Course Evaluation Question

Students will be directed to complete an anonymous evaluation at the end of the course.

Directions: In order to assess the effectiveness of this General Education course, we are asking for students' input on learning objectives. Please indicate how strongly you agree that this course provided you the opportunities to meet the learning objectives. You may also add any comments in the space provided.

ELO 1: Students comprehend mathematical concepts and methods adequate to construct valid arguments.

This course provided opportunities for me to meet this objective

Agree Strongly (5)	Agree (4)	Neutral (3)	Disagree (2)	Disagree Strongly (1)

ELO 2: Students comprehend mathematical concepts and methods adequate to understand inductive and deductive reasoning.

This course provided opportunities for me to meet this objective

Agree Strongly (5)	Agree (4)	Neutral (3)	Disagree (2)	Disagree Strongly (1)

ELO 3: Students comprehend mathematical concepts and methods adequate to increase their general problem solving skills.

This course provided opportunities for me to meet this objective

Agree Strongly (5)	Agree (4)	Neutral (3)	Disagree (2)	Disagree Strongly (1)



Department of Mathematics

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February 15, 2019

Re: Deadline Appeal

Due to individual availabilities, discussion of the Math 1120 new course submission for Autumn 2019 were held at a date later than expected. As such, this new course submission may be later than the expected deadline date. With this in mind, I would respectfully request that this course be allowed to proceed regardless of any missed deadlines.

Sincerely,

William J. Husen, Ph.D.
Director of Undergraduate Instruction