**1. COURSE TITLE\*:** Precalculus

**2**. **CATALOG – PREFIX/COURSE NUMBER/COURSE SECTION\*:** Math 1150

**3. PREREQUISITES\*:**

A student must meet one of the following criteria to register for this course:

- ACT Math score of 24 or higher.

- SAT Math score of 570 or higher.

- Accuplacer AAF score of 263 or higher.

- Four High School Math courses with grades of A, A, B, B or higher.

- A in Math 1118.

- Students with a B in Math 1118 must speak to an advisor before registering.

**COREQUISITE(S)\*: None**

**4. COURSE TIME/LOCATION/MODALITY: (*Course Syllabus – Individual Instructor Specific*)**

**5. CREDIT HOURS\*:** 5 **LECTURE HOURS\*:** 5

 **LABORATORY HOURS\*:** 0 **OBSERVATION HOURS\*:** 0

**6. FACULTY CONTACT INFORMATION: *(Course Syllabus – Individual Instructor Specific)***

**7. COURSE DESCRIPTION\*:**

This is an accelerated course designed to equip students with the mathematical reasoning skills needed to succeed in calculus. It includes a study of polynomial, rational, radical, exponential, logarithmic, and trigonometric functions; systems of linear equations; trigonometric identities; non-right triangles; vectors; conic sections; an introduction to sequences, series, and instantaneous rates of change. Appropriate use of technology is emphasized.

**8. LEARNING OUTCOMES\*:**

At the completion of this course the student will be able to…

1. Perform routine function analysis, providing an organized description including an algebraic discussion of domain, range, zeros, discontinuities, singularities, behavior (increasing, decreasing, extrema, etc.), end-behavior, periodic characteristics (such as period, frequency, phase shift, and amplitude), as well as an informative graph and appropriate approximations.
2. Recognize function families within formulas and equations, identify dominant terms significant to end-behavior, associate factors with zeros and singularity behavior, and anticipate function behavior based on algebraic structure.
3. Parse expressions and distinguish between functions, variables, parameters, and evaluation.
4. Convert a given function representation into a desired form, document restrictions and choices, and furnish an account of the process.
5. Deconstruct a function representation into composition components, providing a description of the separate components along with an explanation of the range-domain mapping connecting the components.
6. Use properties of real numbers to investigate function characteristics and features, including instantaneous rate of change.
7. Calculate and interpret the average rate of a function.
8. Use covariational reasoning strategies by exploring patterns of change between two related quantities in various contexts and representations.
9. Express and translate angular relationships regardless of units or coordinate system.
10. Perform routine analysis of right triangles, including side lengths and angle measurements using trigonometric ratios/functions, as well as the Pythagorean Theorem.
11. Perform routine analysis of general triangles, including side lengths and angle measurements using trigonometric ratios/functions, as well as other relationships.
12. Construct and dissect models blending rectangular coordinates, geometric forms, and trigonometric functions.
13. Purposefully create and use equivalences to support substitutions, targeted arithmetic (elimination, reduction, simplification, etc.), context shifts, and indicate where they are valid.
14. Convert using traditional equivalency families, including variations resulting from arithmetic properties of functions.
15. Demonstrate an understanding of the algebraic, functional, and geometric contexts for equation solutions. (Solutions to equations can simultaneously serve multiple purposes by representing numbers satisfying an equation, zeros of a function, and intersection points of two curves.)
16. Create mathematical models.
17. Communicate rigorously. Reason logically and explain reasoning clearly and legibly, using proper and precise notation.
18. Recognize and verify when a result (theorem) is applicable and use the result to make sound, logical conclusions.
19. Offer counterexamples to conjectures.
20. Investigate based on conditionals (if-then statements) from which strategies and tactics are developed.
21. Outline and carry out multiple steps towards solutions.
22. Integrate graphical and algebraic investigations on limiting behavior at discontinuities and singularities along with end-behavior and communicate findings using proper notation.
23. Differentiate between interval and point-wise characteristics of functions.
24. Use technology to make sense of a situation, develop intuition on function behavior, compare functions, establish connections between algebraic and graphical representations of functions and associated curves, and generate avenues of reasoning.
25. Analyze sequences, including limiting behavior, using appropriate language and precise mathematical notation.

**9. ADOPTED TEXT\*:**

Precalculus 2e

 OpenStax - Open Resource Textbook

Jay Abramson

Download for free at <https://openstax.org/details/books/precalculus-2e>

**9a: SUPPLEMENTAL TEXTS APPROVED BY FULL TIME DEPARTMENTAL FACULTY (INSTRUCTOR MUST NOTIFY THE BOOKSTORE BEFORE THE TEXTBOOK ORDERING DEADLINE DATE PRIOR TO ADOPTION) \*\*\*.**

**10. OTHER REQUIRED MATERIALS: (SEE APPENDIX C FOR TECHNOLOGY REQUEST FORM.)\*\***

Students must have a graphing calculator, but they may not use any calculator that is classified as a symbolic manipulator. Some instructors allow the use of Desmos (a free graphing calculator) on quizzes and tests, so please speak with your instructor prior to purchasing a graphing calculator.

 **11. GRADING SCALE\*\*\*:**

Grading will follow the policy in the catalog. The scale is as follows:

A: 90 – 100

 B: 80 – 89

 C: 70 – 79

 D: 60 – 69

 F: 0 – 59

**12. GRADING PROCEDURES OR ASSESSMENTS: (*Course Syllabus – Individual Instructor Specific)***

|  |  |  |
| --- | --- | --- |
| *Category* | ***EXAMPLE ONLY****Total Points* | *% of Grade* |
| Participation | 100 | 10% |
| Online Homework | 100 | 10% |
| Quizzes | 200 | 20% |
| Exams | 600 | 60% |
| Total | 1000 | 100% |

**13. COURSE METHODOLOGY: *(Course Syllabus – Individual Instructor Specific)***

The course design provides instruction and materials to support the course objectives. Classes may consist of a variety of means to accomplish this including but not limiting to: lectures, class discussions, small group projects, supplemental materials, and outside assignments. Practice is an important part of the learning process. For every one hour of class time, two to three additional hours of study time should be expected.

 **14. COURSE OUTLINE: *(Course Syllabus – Individual Instructor Specific)***

**Chapter 1. Functions**

* 1. Functions and Function Notation – LO3
	2. Domain and Range – LO1, 19
	3. Rates of Change and Behavior of Graphs\* – LO1, 6, 7, 8, 20, 23
	4. Composition of Functions – LO5
	5. Transformation of Functions – LO1
	6. Absolute Value Functions – LO1
	7. Inverse Functions – LO4, 5

\*Note to instructors: In Section 1.3, introduce students to the idea that the instantaneous rate of change of a function is given by the slope of the tangent line. The notation *f* *′(x)* should also be introduced. Discuss how the sign of *f* *′(x)* determines whether a function is increasing or decreasing. Students should understand that an explicit formula for *f* ′(*x)* represents the slope of the tangent line to the graph of *f* at any point *x*. An example worksheet on instantaneous rate of change is available in the math department Canvas course. Additionally, problems from Section 12.4 on derivatives that do not involve limits provide good practice.

**Chapter 3. Polynomial and Rational Functions**

3.2 Quadratic Functions – LO1, 2, 4, 15

3.3 Power Functions and Polynomial Functions – LO1, 2

3.4 Graphs of Polynomial Functions\* – LO1, 2, 18, 22, 23, 24

3.5 Dividing Polynomials – LO4

3.6 Zeros of Polynomial Functions – LO1, 2, 15, 18, 20, 21

3.7 Rational Functions\*\* – LO1, 2, 20, 22, 23, 24

3.8 Inverses and Radical Functions – LO4

3.10 Polynomial and Rational Inequalities\*\*\* – LO2

\*Note to instructors: Introduce students to limit notation to describe the end behavior of polynomial functions.

\*\*Note to instructors: Introduce students to limit notation to describe the local/end behavior of rational functions.

\*\*\*Note to instructors: Section 3.10 is not covered in the textbook. Students should know how to solve polynomial and rational inequalities (both graphically and algebraically).

**Chapter 4. Exponential and Logarithmic Functions**

4.1 Exponential Functions – LO1

4.2 Graphs of Exponential Functions – LO1, 24

4.3 Logarithmic Functions – LO1

4.4 Graphs of Logarithmic Functions – LO1, 24

4.5 Logarithmic Properties – LO13, 14

4.6 Exponential and Logarithmic Equations – LO13, 20

4.7 Exponential and Logarithmic Models\* – LO13, 16

\*Note to instructors: Only cover exponential growth and decay models and expressing exponential models in base *e*.

**Chapter 5. Trigonometric Functions**

5.1 Angles – LO9

5.2 Unit Circle: Sine and Cosine Functions – LO9

5.3 The Other Trigonometric Functions – LO6, 9

5.4 Right Triangle Trigonometry – LO10, 12

**Chapter 6. Periodic Functions**

6.1 Graphs of the Sine and Cosine Functions – LO1

6.2 Graphs of the Other Trigonometric Functions – LO1, 2, 22

6.3 Inverse Trigonometric Functions – LO5

**Chapter 7. Trigonometric Equations with Identities**

7.1 Simplifying and Verifying Trigonometric Identities – LO13, 15, 17, 19

7.2 Sum and Difference Identities – LO13

7.3 Double-Angle, Half-Angle, and Reduction Formulas – LO13

7.5 Solving Trigonometric Equations – LO13, 15, 17

**Chapter 8. Further Applications of Trigonometry**

8.1 Non-right Triangles: Law of Sines – LO11, 21

8.2 Non-right Triangles: Law of Cosines – LO11, 21

8.8 Vectors – LO9, 10

 **Chapter 9. Systems of Equations and Inequalities**

9.1 Systems of Linear Equations: Two Variables – LO15

**Chapter 10. Analytic Geometry**

10.0 The Circle\* – LO13

10.1 The Ellipse – LO12, 15

10.2 The Hyperbola – LO12, 15

10.3 The Parabola – LO12, 15

\*Note to instructors: Section 10.0 is not covered in this Precalculus textbook. See Section 11.1 of https://openstax.org/books/intermediate-algebra-2e/ instead.

**Chapter 11. Sequences, Probability, and Counting Theory**

11.1 Sequences and Their Notations – LO25

11.2 Arithmetic Sequences – LO25

11.3 Geometric Sequences – LO25

11.4 Series and Their Notations\* – LO25

 \*Note to instructors: Do not cover annuities.

**Recommended course calendar:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Sections** | **Assignments** | **Learning****Outcomes** |
| Week 1:  | 1.1, 1.2, 1.3  | * Online HW
* Written HW
 | 1, 3, 6, 7, 8, 19, 20, 23 |
| Week 2: | 1.4, 1.5, 1.6, 1.7 | * Quiz 1 (1.1 – 1.3)
* Online HW
* Written HW
 | 1, 4, 5 |
| Week 3:  | 3.2, 3.3, 3.4 | * Quiz 2 (1.4 – 1.7)
* Online HW
* Written HW
 | 1, 2, 4, 15, 18, 22, 23, 24 |
| Week 4:  | 3.5, 3.6 | * Test 1 (1.1 – 1.7, 3.2 – 3.4)
* Online HW
* Written HW
 | 1, 2, 4, 15, 18, 20, 21 |
| Week 5:  | 3.7, 3.8, 3.10 | * Quiz 3 (3.5, 3.6)
* Online HW
* Written HW
 | 1, 2, 4, 20, 22, 23, 24 |
| Week 6:  | 4.1, 4.2, 4.3, 4.4 | * Quiz 4 (3.7 – 3.8, 3.10)
* Online HW
* Written HW
 | 1, 24 |
| Week 7: | 4.5, 4.6, 4.7 | * Quiz 5 (4.1 – 4.4)
* Online HW
* Written HW
 | 13, 14, 16, 20 |
| Week 8: | 5.1, 5.2 | * Test 2 (3.5 – 3.8, 3.10, 4.1 – 4.7)
* Online HW
* Written HW
 | 9 |
| Week 9:  | 5.3, 5.4, 6.1 | * Online HW
* Written HW
 | 1, 6, 9, 10, 12 |
| Week 10: | 6.2, 6.3, 7.1 | * Quiz 6 (5.1 – 5.4, 6.1)
* Online HW
* Written HW
 | 1, 2, 5, 13, 15, 17, 19, 22 |
| Week 11: | 7.2, 7.3, 7.5 | * Quiz 7 (6.2 – 6.3, 7.1)
* Online HW
* Written HW
 | 13, 15, 17 |
| Week 12:  | 8.1, 8.2 | * Test 3 (5.1 – 5.4, 6.1 – 6.3, 7.1 – 7.3, 7.5)
* Online HW
* Written HW
 | 11, 21 |
| Week 13:  | 8.8, 9.1, 10.0 | * Quiz 8 (8.1, 8.2)
* Online HW
* Written HW
 | 9, 10, 13, 15 |
| Week 14:  | 10.1, 10.2, 10.3, 11.1 | * Quiz 9 (8.8, 9.1, 10.0)
* Online HW
* Written HW
 | 12, 15, 25 |
| Week 15: | 11.2, 11.3 11.4 | * Quiz 10 (10.1 – 10.3, 11.1)
* Online HW
* Written HW
 | 25 |
| Finals: |  | * Test 4 (8.1 – 8.2, 8.8, 9.1, 10.0 – 10.3, 11.1 – 11.4)`
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**15. SPECIFIC MANAGEMENT REQUIREMENTS\*\*\*:**

**16. FERPA: \***

Students need to understand that their work may be seen by others. Others may see your work when being distributed, during group project work, or if it is chosen for demonstration purposes. Students also need to know that there is a strong possibility that your work may be submitted to other entities for the purpose of plagiarism checks.

**17.** **ACCOMMODATIONS:\***

Students requesting accommodations may contact Ryan Hall, Accessibility Coordinator at rhall21@sscc.edu or 937-393-3431 X 2604.

Students seeking a religious accommodation for absences permitted under Ohio’s Testing Your Faith Act must provide the instructor and the Academic Affairs office with written notice of the specific dates for which the student requires accommodation and must do so no later than fourteen (14) days after the first day of instruction or fourteen (14) days before the dates of absence, whichever comes first. For more information about Religious Accommodations, contact Ryan Hall, Accessibility Coordinator at rhall21@sscc.edu or 937-393-3431 X 2604.

**18. OTHER INFORMATION\*\*\*:**

**SYLLABUS TEMPLATE KEY**

**\*** Item cannot be altered from that which is included in the master syllabus approved by the Curriculum Committee.

**\*\*** Any alteration or addition must be approved by the Curriculum Committee

**\*\*\*** Item should begin with language as approved in the master syllabus but may be added to at the discretion of the faculty member.