Course: PreCalculus **Unit # 4: Limits**	**Year of Implementation:** 2025-2026

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
{provide all applicable links to standards here}
https://www.nj.gov/education/standards/

- **Unit Standards:** *(keep each of the following headings in place)*
  - ***Content Standards***

    Standard: F-IF.B. Interpret functions that arise in applications in terms of the context

    4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.
  - ***21st Century Life & Career Standards***
    - All curriculum writers/revisionists need to include standards that apply to "Career Readiness, Life Literacies, and Key Skills". This should include a brief description of the standard and the standard number. Document only those standards and practices that apply to each unit. Use the following link to assist you [see pages of 31-36; 41-42; 53-56 for specific standard #'s and strands]
      https://www.state.nj.us/education/cccs/2020/2020%20NJSLS-CLKS.pdf

      - 9.4.12.CT.2 Explain the potential benefits of collaborating to enhance critical thinking and problem solving.
      - 9.4.12.CI.1 Demonstrate the ability to reflect, analyze, and use creative skills and ideas.
      - 9.4.12.TL.3 Analyze the effectiveness of the process and quality of collaborative environments.

  - ***Interdisciplinary Content Standards***

- 8.2.12.EC.3 Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

- ***NJ Statutes:*** NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

  Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

  Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

  LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

  Diversity and Inclusion (N.J.S.A. 18A:35-4.36a) A board of education shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards.

  Asian American and Pacific Islanders (AAPI) P.L.2021, c.410 Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416)

For additional information, see

NJ Amistad Curriculum: ***https://www.nj.gov/education/amistad/about/***

Diversity and Inclusion: ***https://www.nj.gov/education/standards/dei/index.shtml***

- *(Sample Activities/ Lessons):* ***https://www.nj.gov/education/standards/dei/samples/index.shtml***

Asian American and Pacific Islanders:

- ***Asian American and Pacific Islander Heritage and History in the U.S.***
  A Teacher's Guide from EDSITEment offering a collection of lessons and resources for K-12 social studies, literature and arts classrooms that center around the experiences, achievements and perspectives of Asian Americans and Pacific Islanders across U.S. history.

Transfer Goal: Students will be able to independently use their learning to analyze and describe the behavior of functions in various contexts, such as predicting trends in data, determining rates of change in physical systems, model population growth or decay and optimize solutions in economics and business.

As aligned with LRHSD Long Term Learning Goal(s): https://www.lrhsd.org/academics/program-of-studies/curriculum

1. Problem-Solving: apply and transfer autonomously and collaboratively mathematical concepts and problem- solving techniques to unfamiliar, varied and real-world situations
2. Reasoning: reason abstractly and quantitatively by applying mathematical representations, symbols and estimation techniques when engaging in problem-solving
3. Critical Thinking: construct and effectively communicate valid conclusions and critique the reasoning of others
4. Modeling: demonstrate mastery of concepts by evaluating models that others have constructed or by creating appropriate models of their own
5. Tools: identify the correct tools to solve problems, if applicable
6. Precision: determine an answer's appropriateness as a means of determining its validity, while using proper mathematical notation and units
7. Structure: use multiple representations, critical thinking skills, and prior knowledge to solve problems in new situations
8. Patterns: analyze data and recognize patterns in a variety of situations
9. Habits of Mind: approach new situations with curiosity, persistence, resourcefulness, and confidence; take risks, monitor

their progress, accept and learn from setbacks, make adjustments, and reflect on their performance.

Enduring Understandings Students will understand that. . .	*Essential Questions*
EU 1 investigation and exploration are essential to the development of mathematical ideas. The symbolic language of algebra is used to communicate and generalize the patterns in mathematics. *EU 2* the behavior of a function around a point is related to the limit and continuity at that point.	● What are the methods to determine the limit of a function? ● How can limits be used to analyze a graph and determine the continuity of a function?
Knowledge *Students will know . . .*	*Skills* *Students will be able to. . .*
EU 1 ● finding limits helps predict the behavior of functions in a precise and meaningful way. (F-IF.B.4) ● finding limits around asymptotes provides insight into how functions behave near points where they may become unbounded or undefined. (F-IF.B.4) *EU 2* ● analyzing the limits to determine continuity ensures the function's value and limits match at that point. (F-IF.B.4)	*EU 1* ● estimate limits from graphs or tables of data. (F.IF.B.4) ● evaluate limits using algebraic techniques, especially those in indeterminate form. (F-IF.B.4) ● determine behavior around asymptotes using infinite limits and limits at infinity. (F.IF.B.4) *EU 2* ● determine continuity in terms of limits. (F-IF.B.4) ● describe real-life applications using limits. (F-IF.B.4)

Stage Two - Assessment

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Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.** *{place A, M and/or T along with the applicable EU number in parentheses after each statement} All knowledge and skills must be addressed in this section with a corresponding lesson/activity which teaches each concept. The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy): Red = Interdisciplinary Connection; Purple = 21st Century Life & Career Connection*

- Introduction To Limits Activity (A, EU1)
  https://teacher.desmos.com/activitybuilder/custom/5f0ac1a76b793b73785aeb49
- Walking Limits Interactive Activity (M,T, EU1)
  Walking Limits.png
- Continuity (A, M, T, EU2)
  https://teacher.desmos.com/activitybuilder/custom/5d75115b4fc8b00a877e57aa
- Linerider Discontinuities (T, EU2)

Use the Linerider app (https://www.linerider.com) to have students create a track with Jump, removable, and infinite discontinuities.

Suggested Sequence of Learning Activities

- Introduction to Limits Activity linked above (A, EU1)
- Estimate a limit using a numerical or graphical approach, including one-sided limits (M,T, EU1)
- Walking Limits Interactive Activity linked above (M,T, EU1)
- Learn different ways that a limit can fail to exist (T, EU1)
- Evaluate a limit using properties of limits (A,M,T, EU1)
- Evaluate a limit using algebraic techniques(direct substitution, cancellation, rationalization) (A, M, EU 1)
- Evaluate one-sided limits and connect to continuity on a closed interval (A,M,T, EU2)
- Apply the Test for Continuity to determine continuity at a point (A, EU2)
- Continuity Activity linked above (A,M,T, EU2)
- Linerider Discontinuity Activity linked above (T, EU2)
- Determine limits at infinity and connect to the left and right end behavior of a graph (A, M, EU2)

Pacing Guide

{This chart will be identical in all of the units for this course.}

Unit #	***Title of Unit***	***Approximate # of teaching days***
1	Conics	12
2	Trigonometry	56
3	Functions	57
4	Limits	10

Instructional Materials

TI-Nspire Calculator
DESMOS online graphing calculator and activities
Khan Academy
Kuta Infinite Software

Accommodations

Special Education: The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.

Students with 504 Plans: Students will be accommodated based on specific accommodations listed in the 504 Plan.

English Language Learners: Students will be accommodated based on individual need and in consultation with the ELL teacher.

Students at Risk of School Failure: Students will be accommodated based on individual need and provided various structural supports through their school.

Gifted and Talented Students: Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.