Unit_2 Limits and Continuity

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 1**
Length: **5 weeks**
Status: **Published**

Brief Summary of Unit

Students will study the limits and continuity of a function algebraically and graphically. The limit of a function is the value the function approaches from both the left and right side. If a graph is continiuous at a point then the graph has a limit at the point. Continuity of a function implies there are no breaks in the graph of the function. Students will learn how asymptotes effect the limit of a function.

Standards

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.K-12.NJSLSA.L4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
LA.K-12.NJSLSA.L5	Demonstrate understanding of word relationships and nuances in word meanings.
	Mathematical and computational thinking in 9–12 builds on K–8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.
MA.9-12.I	Functions, Graphs, and Limits
MA.9-12.I.A	Analysis of graphs
MA.9-12.I.B	Limits of functions (including one-sided limits)
MA.9-12.I.B.1	An intuitive understanding of the limiting process
MA.9-12.I.B.2	Calculating limits using algebra
MA.9-12.I.B.3	Estimating limits from graphs or tables of data
MA.9-12.I.C	Asymptotic and unbounded behavior

MA.9-12.I.C.1	Understanding asymptotes in terms of graphical behavior
MA.9-12.I.C.2	Describing asymptotic behavior in terms of limits involving infinity
MA.9-12.I.D.2	Understanding continuity in terms of limits
TEC.K-12.8.1	All students will use computer applications to gather and organize information and to solve problems.
TEC.K-12.8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual society, and the environment.
WORK.K-12.9.1	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.
WORK.K-12.9.2	All students will develop career awareness and planning, employability skills and foundational knowledge necessary for success in the workplace.

Transfer

- Students will apply limits and continuity to model real life scenarios that connect to physics (velocity) and economics (marginal)
- Students will connect continuity to data analysis

Essential Questions

- How are limits and continuity related to each other?
- How does continuity of a function effect data analysis?
- What does a limit represent? Do limits exist for all functions? at all points of a function?

Essential Understandings

- A discontinuity of a function may be a removable hole, non removable jump or a non removable vertical asymptote.
- A polynomial function is continuous for all real numbers.
- A rational function is continuous for its domain.
- How are limits estimated from tables of data?
- How are limits estimated graphically?
- How are limits evaluated algebraically?
- How are limits related to vertical asymptotes? horizontal asymptotes?
- How can the limit of f(x) as x approaches c exist if f(c) is undefined?
- How do asymptotes effect the graphical behavior of a function?
- The limit exists for all points of a polynomial function.
- The limit of a function is the value that the graph approaches from both left and right side as x approaches c.
- What can be determined if a left sided and right sided limit are the same? What is determined if they are different?

Students Will Know

- The algebraic methods to solve limits including the simplification method (factor/cancel), common denominator, conjugates and table method
- The connection between continuity and limits of a function.
- The difference between the value of a function at a value and the limit of a function at a value of x.
- The formal definition of a limit.
- The graphical properties of a continuous function.
- The notation for a two sided limit as well as a one sided limit.
- The properties of polynomial and non-polynomial functions

Students Will Be Skilled At

- Creating graphs of a function given verbal description of the functions limit and continuity.
- Defining continuity in terms of limits.
- Discussing the limit and continuity of a piece wise function.
- Evaluate limits using an algebraic process.
- Evaluate limits using graphical anyalsis
- Evaluating limits from a table of values.
- Investigate the asymptotic behavior of a function in terms of limits involving infinity.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions

- Graded Do Now assessments that reflect student understanding of class notes and homework.
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations (problems of the week)

Learning Plan

A graphing calculator will be utilized throught the unit. Students will use the table feature, value feature and zero feature throughout the unit. Students need to be made aware of the limitations of the graphing calculator (the calculator will not show holes visually on the graph, but a blank value will show when using the value feature of the calculator).

- Discuss asymptotes and how they effect limit values.
- Discuss continuity by its definition. Introduce discontinuous functions and their classifications.
- Discuss the concept of a limit in a mathematical context. Use tables of data to find limits of functions.
- Introduce the concept of a limit in real world context.
- Introduce the notation for a limit.
- Work on calculating limits algebraically and graphically using the graphing calculators.

Materials

Core Book List including AP Calculus Larson 12E

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites - graphing calculator activites
- Teacher created notes

Suggested Strategies for Modifications

Possible accommodations/modification for CP Calculus