Pre-Calculus Honors - Unit G - Introduction to Calculus

Unit Focus

This short unit introduces students to the concepts of limits and derivatives. Various techniques for determining limits are explored: graphically, numerically (table), comparing the one-sided limits, and algebraically or direct substitution, if possible. Limits are then applied to the slope of secant lines to determine the slope of a curve at a single point (slope of the tangent line) using the limit definition of a derivative. Infinite limits and limits of summations are discussed and if there is time, used to determine the area under a curve.

Stage 1: Desired Results - Key Understandings

Standard(s)

Common Core
Mathematics: 9-12

- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Look for and express regularity in repeated reasoning. (CCSS.MATH.MP.8)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

Transfer

Students will be able to independently use their learning to...
T1 manipulate equations/expressions or objects to create order and establish relationships.
T2 draw conclusions about graphs, shapes, equations, or objects.
T3 use appropriate tools to make reaching solutions more efficient, accessible and accurate.

Meaning

Understanding(s)

Students will understand that...
U1 Mathematicians flexibly use different tools, strategies, and operations to build conceptual knowledge or solve problems.
U2 Mathematicians examine relationships to discern a pattern, generalizations, or structure.
U3 Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.

Essential Question(s)

Students will keep considering...
Q1 What math tools/models/ strategies can I use to solve the problem?
Q2 What is the best way to show my thinking?
Q3 Does this solution make sense?

Acquisition of Knowledge and Skill

Knowledge

Students will know...
K1 Limits are y- values that the function approaches as x gets closer to a particular value. The point does not have to exist for the function though.
K2 If the one-sided limits match, then the limit exists.
K3 A derivative is a formula for slope
K4 Infinite limits are equivalent to horizontal asymptotes

Skill(s)

Students will be skilled at...
S1 Determining limits from graphs, tables, and equations
S2 Evaluating one-sided limits
S3 Using the limit definition to find the derivative
S4 Applying derivatives to find equations of tangent lines
S5 Determining limits at infinity

Stage 1: Desired Results - Key Understandings		
	K5 The formulas for summing integers from 1 to n and squares from 1 to n^2. **K6** Infinite summations are only possible if the terms converge to zero. **K7** Vocabulary: Limit, difference quotient, derivative, equation of tangent line	**S6** Finding summations of limits **S7** Using summation to find the area under a curve