Unit G - *Introduction to Calculus*

Overview

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.

21st Century Capacities: Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS	Transfer:
MP 1 Make sense of problems and persevere in solving them **MP2** Reason abstractly and quantitatively **MP8** Look for and express regularity in repeated reasoning	*Students will be able to independently use their learning in new situations to...* 1. Manipulate equations/expressions or objects to create order and establish relationships. 2. Draw conclusions about graphs, shapes, equations, or objects. (synthesizing) 3. Use appropriate tools to make reaching solutions more efficient, accessible and accurate.

Meaning:

UNDERSTANDINGS: *Students will understand that:*	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*
1. Mathematicians flexibly use different tools, strategies, and operations to build conceptual knowledge or solve problems. 2. Mathematicians examine relationships to discern a pattern, generalizations, or structure. 3. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.	A. What math tools/models/strategies can I use to solve the problem? B. What is the best way to show my thinking? C. Does this solution make sense?

Acquisition:	
Students will know…	*Students will be skilled at…*
1. 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. 2. If the one-sided limits match, then the limit exists. 3. A derivative is a formula for slope 4. Infinite limits are equivalent to horizontal asymptotes 5. The formulas for summing integers from 1 to n and squares from 1 to n^2. 6. Infinite summations are only possible if the terms converge to zero. 7. Vocabulary: Limit, difference quotient, derivative, equation of tangent line	1. Determining limits from graphs, tables, and equations 2. Evaluating one-sided limits 3. Using the limit definition to find the derivative 4. Applying derivatives to find equations of tangent lines 5. Determining limits at infinity 6. Finding summations of limits 7. Using summation to find the area under a curve