Unit C - *Derivatives*

Overview

Students are introduced to the derivative as the slope of the line tangent to a function at any point. Students will practice finding derivative first using the limit definition and then using the rules and algebraic computation and the chain rule. Student will study implicit differentiation and apply this concept to related rate problems.

By then end of this unit students should be able to determine the equation of the tangent to a graph using explicit or implicit derivatives. Students should also be able to distinguish between position, velocity and acceleration and how they relate to each other in terms of being derivatives of each other.

There are many places to be careful and apply numerous rules at the same time. If extra time is necessary, take that time. Students must know derivative before they can do integral.

21st Century Capacities: Collective Intelligence, Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them

MP2 Reason abstractly and quantitatively

MP4 Model with Mathematics
MP6 Attend to precision

MP7 Look for and make use of structure

Transfer:

Students will be able to independently use their learning in new situations to...

1. Demonstrate fluency with math facts, computation and concepts.(Synthesizing)
2. Justify reasoning using clear and appropriate mathematical language. (Collective Intelligence)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians represent and analyze mathematical situations and structures using algebraic symbols to communicate thinking.
2. Mathematicians use models to represent and make meaning of quantitative relationships.
3. Mathematicians argue the relationships between problem scenarios and mathematical representation.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How do you express and describe a pattern and use it to make predictions and solve a problem?
B. How can change be described?
C. How do I interpret this mathematical model?

	Acquisition:	
	Students will know… 1. The slope of tangent to a function at a given point if the function is the limit of the slopes of the of the secants through points close to the given point 2. Whether or not a limit exists at a given point 3. The limit definition of a derivative 4. How to find high order derivatives 5. $\lim_{x \to 0} \frac{sinx}{x} = 0$ 6. The chain rule 7. The difference between implicit and explicit differentiation 8. Slope is the rate of change 9. Meaning between positive and negative slopes 10. Rolle's Theorem 11. Mean Value Theorem 12. Vocabulary: implicit differentiation, implicit differentiation	*Students will be skilled at…* 1. Finding the slope of a tangent to a function using the a) limit of the difference quotient formula b) visual inspection c) tables on the calculator 2. Finding equations of tangent lines 3. Using the limit definition to find a derivative in polynomial, rational and radical functions 4. Sketching a graph of f '(x) given the graph of f(x) and the graph of f(x) given f '(x) 5. Using the power rule and the general derivative rule to find derivatives algebraically 6. Computing velocity and acceleration given the position equation 7. Using the derivative to find where the slope of a tangent is 0 and then determining its significance 8. Using product and quotient rules to determine a derivative algebraically 9. Using the derivative rules for the six trig functions 10. Using the derivative rules for exponential and log functions 11. Using the chain rule to find derivatives of composite functions algebraically 12. Finding derivatives using implicit differentiation 13. Solving related rates application problems by a) sketching (words→diagram) b) setting up an appropriate formulaic equation c) differentiating with respect to time d) solving for the unknown 14. Using the mean value theorem to a) determine the point where instantaneous rate of change is equivalent to the average rate of change (and what that means) b) determine whether or not zero(s) exist in a given interval for a given function