Unit B - *Limits and Continuity*

Overview

Students are introduced to the concept of a limit. Different representations will provide students with a deep understanding of limits. Simple computations of limits are introduced. Students will understand continuity of its implications.

For all written exercises, students must give a specific justification for any answer. Notation used must be correct. For example:

$\lim_{x\to 3}\frac{x^2-4x+3}{x-3}=\lim_{x\to 3}\frac{(x-3)(x-1)}{x-3}=\lim_{x\to 3}(x-1)=2$ or $\lim_{x\to 3}\left[\frac{x^2-4x+3}{x-3}=\frac{(x-3)(x-1)}{x-3}=x-1\right]=2$

not $\lim_{x\to 3}\frac{x^2-4x+3}{x-3}=\frac{(x-3)(x-1)}{x-3}=x-1=2$

Prerequisite skills to review:

- toolkit graphs
- rational, absolute value functions
- radical functions
- domain restrictions
- factoring polynomials

21st Century Capacities: Analyzing, Collective Intelligence

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with Mathematics
MP6 Attend to precision
MP7 Look for and make use of structure

CCSS.MATH.CONTENT.HSF.IF.B.6

Transfer:

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

1. Represent and interpret patterns in numbers, data and objects. (Analyzing and Collective Intelligence)
2. Demonstrate fluency with math facts, computation and concepts.

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	A. How do I interpret this mathematical model? B. What math tools/models/strategies can I use to solve

<table>
<tr><td rowspan="3">Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*</td><td>conceptual knowledge or solve problems.
2. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
3. Mathematicians represent and analyze mathematical situations and structures using algebraic symbols to communicate thinking.</td><td>the problem?
C. How can understanding a pattern help me?</td></tr>
<tr><td colspan="2">Acquisition:</td></tr>
<tr><td>Students will know…

1. The addition, subtraction, multiplication, division and constant factor rules for limit computation
2. The three conditions to guarantee continuity
3. The relationship between the $\lim_{x\to\infty}$ f(x) and any horizontal asymptote on the graph of y = f(x)
4. Vocabulary: one sided limit, undefined limit, continuity, discontinuity, open and closed intervals, delta, epsilon</td><td>Students will be skilled at…

1. Determining a limit visually from a graph
2. Determining whether a limit exists of not by graphing or by a table on a calculator
3. Sketching a reasonable image of a graph given a point and limit information about the graph
4. Computing limits using graphs, algebraic manipulation or direct substitution
5. Computing limits at different points in the domain of a piecewise function
6. Determining continuity and discontinuity and prove using definition
7. Given a graph, determine intervals of continuity and/or point(s) of discontinuity
8. Given an equation, finding any point(s) of discontinuity and tell whether they are removable or not
9. Using intermediate value theorem to prove existence of zeros in a closed interval
10. Determining limits involving infinity on rational and exponential functions
11. Determining all asymptotes of rational functions
12. Proving limits using the formal definition of a limit (in terms of delta and epsilon) (simple problems to stress concept over computation)</td></tr>
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