Unit 1: Functions, Limits and Continuity

Content Area: **Mathematics**
Course(s): **Advanced Placement Calculus**
Time Period: **September**
Length: **4 weeks**
Status: **Published**

Enduring Understandings:

- Algebra, trigonometry, and logarithms are essential tools for the study of calculus.
- Continuous functions model real-life phenomena.
- During direct substitution students will misinterpret solutions with zero as a denominator as Does not Exist.
- The concept of a limit is one of the foundations of calculus.

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Essential Questions:

- How do limits guarantee the continuity of a function?
- How does the math that you previously studied relate to the math that you are going to be studying?
- What is the difference between calculating a limit and evaluating a function at a point?
- When do limits fail to exist?

Lesson Titles:

- An intuitive understanding of continuity. (The function values can be made as close as desired by taking sufficiently close values of the domain.)
- Comparing relative magnitudes of functions and their rates of change (for example, contrasting exponential growth, polynomial growth, and logarithmic growth).
- Continuity as a property of functions
- Estimating limits from graphs or tables of data.
- Evaluating limits algebraically
- Geometric understanding of graphs of continuous functions (Intermediate Value Theorem and Extreme Value Theorem)
- Intro. of one and two sided limits

- Introduction of limits graphically
- Limits and continuity
- Limits approaching infinity
- Understanding continuity in terms of limits

Equity Considerations

Asian American and Pacific Islander Mandate

Topic (Person and Contribution Addresses):

We will be analyzing the population difference in Vietnam in 2010 as well as the projected population of China in 2050. This is textbook problem on page 48 #64 and 66. It is about using the graphs and our knowledge about describing graphs to see what is happening to their populations and what predictions can we make.

I will also introduce the students to Kalpana Chawla. Chawla is an Indian-born American astronaut and mechanical engineer. She first flew on the space shuttle Columbia in 1997 as a mission specialist and primary robotic arm operator. Sadly she lost her life during her second mission.

Materials Used:

- Note packet (problems will be transferred there)

https://ideas.ted.com/8-asian-americans-and-pacific-islanders-whose-innovations-have-changed-your-life-really/

Climate Change

Students will examine ways trig is embedded in climate change through the following activity. This lesson plan will enable students to apply simple trigonometric functions to understand the phenomenon of climate change

https://tropicsu.org/lesson-plan-trigonometry-and-sea-level-rise/

SCI.HS-ESS2-1	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

LGBTQ and Disabilities Mandate

Topic (Person and Contribution Addresses):

We will be discussing the life and work of Florence Nightingale and/or Sara Josephine Baker (aka Doctor Jo). Both women are responsible for stopping the spread of deadly diseases.

Materials Used:

- Note packet

LGBTQ:

Sir Francis Bacon (1561–1626)

Florence NightingaleFrancis Bacon | Philosophy, Scientific Method, & Facts | Britannica(1820-1910)

George Washington Carver (1861-1943)

Sara Josephine Baker (1873-1945)

Alan Turing (1912-1954)

Allan Cox (1926-1987)

Sally Ride (1951-2012)

Ben Barres (1954-2017)

Ruth Gates (1962-2018)

Tim Cook (1960)

STEM

Disabilities:

Leonardo da Vinci (1452-1519)- Dyslexia

Isaac Newton (1664-1727)- Epilepsy

Thomas Edison (1847-1931)- Hearing

Charles Darwin (1809-1882)- Stutter, Dyslexia

Alexander Graham Bell (1847-1922)- Deaf

Albert Einstein (1879-1955)- Aspergers

Florence B. Seibert (1897-1991)- Mobility

Stephen Hawking (1942-2019)- ALS

John Forbes Nash (1928-2015)- Schizophrenia

Temple Grandin (1947)- Autism

Inter-Disciplinary Connections:

LA.RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
LA.WHST.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
LA.WHST.9-10.2.E	Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Analysis of end behavior of limits
- Analysis of graphs
- Blooms Analysis - Break down objects or ideas into simpler parts and find evidence to support generalizations
- Blooms Application - Apply Knowledge to actual situations
- Blooms Evaluation - Make and defend judgments based on internal evidence or external criteria
- Blooms Knowledge - Remember previously learned information
- Blooms Synthesis - Compile component ideas into a new whole or propose alternative solutions
- Intro. calculating utilizing direct substitution
- Intro. continuity
- Intro. finding limits of trig functions
- Intro. finding limits using conjugates
- Intro. indeterminate forms
- Intro. limits approaching asymptotes
- Intro. limits approaching infinity
- Intro. rational limits
- Provide individual activity
- Provide real world examples
- Provide team work activity
- review homework
- review vocabulary that is associated with this unit

Modifications

Formative Assessment:

- AP style multiple choice
- closure: pass out class infinity practice
- Pair share
- Partner answer/analyze questions
- Pass out of class
- warm up: partner continuity practice

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment:

- AP Free response Questions
- AP practice tests
- Individual Assignment
- Marking Period Assessment
- performance task
- Project
- quiz: continuity
- Quiz: evaluate limits

- Review game
- Tets: limits

Resources & Materials:

- AP sample Questions
- data investigations
- Establish a set of general strategies for student independence and self-evaluation
- Evoke student participation from their seats and at the board
- Independent/Cooperative learning explorations
- Powerpoint lessons
- Smartboard Lessons