Unit 1: Trigonometry and Pre-Calculus Review

Content Area: **Mathematics**
Course(s): **Honors Calculus**
Time Period: **September**
Length: **3 weeks**
Status: **Published**

Unit Overview

This unit is designed to review trigonometric functions, radian and degree measure, parent graphs of functions and trig functions, review of the unit circle, writing equations of lines, and proving trig identities.

Enduring Understandings

- performing calculations. Knowing when exactverses generalized calculation is appropriate and develops insight into a mathematical theory when they see how it relates to actual calculations.
- Think logically in a world that requires careful thought as a reasoning process
- Understand the various types of models used in mathematics and how to translate real life situations to those mathematical models to obtain a solution and then to translate those solutions back into the context of the real-life application.

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

- What is the unit circle?
- What makes an identity fundamental?
- What makes special angles so special?
- Can trig equations be solved?
- How do you verify trig identities?
- What do trigonometric functions look like?

Standards/Indicators/Student Learning Objectives

- SWBAT analyse graphs and explian the transformations performed on the parent graph

- SWBAT apply slopes of lines
- SWBAT explain symmetry of functions
- SWBAT extend trig functions using the unit circle
- SWBAT memorize and apply the unit circle
- SWBAT prove basic trig identities
- SWBAT recognise and apply transformations to parent graphs
- SWBAT use inverse functions to solve trig equations
- SWBAT write equation of lines
- SWBAT write equations of tangent lines

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.F-TF.A	Extend the domain of trigonometric functions using the unit circle
MA.F-TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
MA.F-TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
MA.F-TF.A.3	Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosines, and tangent for π – x, π + x, and 2π – x in terms of their values for x, where x is any real number.
MA.F-TF.A.4	Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
MA.F-TF.B	Model periodic phenomena with trigonometric functions
MA.F-TF.B.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
MA.F-TF.B.6	Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
MA.F-TF.B.7	Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
MA.F-TF.C	Prove and apply trigonometric identities
MA.F-TF.C.8	Prove the Pythagorean identity $sin^2(\theta) + cos^2(\theta) = 1$ and use it to find $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ given $sin(\theta)$, $cos(\theta)$, or $tan(\theta)$ and the quadrant of the angle.
MA.F-TF.C.9	Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Lesson Titles/Objectives

- To Model and solve real-life problems
- amplitude and period of trig functions

- converting degrees to radians
- converting radians to degrees
- graphing basic trig functions
- parent graphs of functions
- proving trig identities
- right triangle trig
- To Evaluate of trigonometric functions and their graphs
- To review analytical skills through the verification of trigonometric identities
- To Use of the calculator as a mathematical tool
- transformations of parent functions
- Understand fundamental trig identities and concepts
- writing equation of lines

Inter-Disciplinary Connections

LA.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
LA.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RST.11-12.5	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

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

- 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
- Provide individual activity
- Provide real world examples
- Provide team work activity
- review converting degrees to radians
- review converting radians to degrees
- Review Homework
- review proving trig identities
- review rational exponents
- review right triangle trig

- review slopes of parallel and perpendicular lines
- review trig identities
- Review Vocabulary for this unit
- review writing equations of lines

Modifications

ELL Modifications

- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Offer alternate/or modify assessments
- Offer resources for specific topics in primary language (Youtube web resources)
- Repeat, reword, clarify
- Tap prior knowledge
- Tutoring During Delsea One

IEP & 504 Modifications

- math tests could have formula's available on the test and/or sample problems
- providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides
- students could use calculator and/or other math tools (x grids, chips, ect)
- Tutoring During Delsea One

G&T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning.
- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a specific career they are interested in? How would this apply to their interest?)
- Math- provide additional rigorous challenge problems for advanced students

At Risk Modifications

- additional help during tutoring/Delsea One/Academic Enrichment
- outlines & graphic organizers
- speaking to students privately when redirecting behaviors
- study guides

- Tutoring During Delsea One
- visuals

Equity Considerations

Asian American and Pacific Islander Mandate

Students will engage in learning different AAPI mathematicians that have contributed to mathematical processes and developments.

https://www.youtube.com/watch?v=_pUHaSapfuo

https://www.ngpf.org/blog/math/math-monday-celebrating-aapi-mathematicians/

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

LGBTQ and Disabilities Mandate

Students will engage in learning different mathematicians from the LGBTQ community along with those with disabilities that have made significant impacts in math.

STEM

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)

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

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.

Formative Assessment

- five minute check with unit circle
- matching parent graphs to their transformations

- pair share
- Partner answer/analyze question
- pass out of class
- pass out of class: trig identity proof: catch the mistake
- Poll everywhere question to be posted on smartboard
- warm up: amplitude and period of trig functions

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Reflective pieces

Concept maps

Case-based scenarios

Portfolios

Benchmark Assessment

Skills-based assessment- math practice

Summative Assessment

- marking period assessment

Resources & Materials

- Calculus: Graphical, Numerical, Algebraical, by Finney, Demana and Kennedy
- Establish a set of general strategies for student independence and self-evaluation
- Evoke student participation from their seats and at the board
- Graphing Calculator acitivities

- Independent/Cooperative learning explorations
- Powerpoint lessons
- Smartboard Lessons
- Teacher Generated Worksheets

Technology

- free-test-online.com/calculus
- google classroom
- graphing calculator activities
- www.kahoot.com
- www.khanacademy.org/math/calculus
- www.quizizz.com
- www.quizlet.com

TECH.8.1.12.A.3	Collaborate in online courses, learning communities, social networks or virtual worlds to discuss a resolution to a problem or issue.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.2.12.A.3	Research and present information on an existing technological product that has been repurposed for a different function.