

Algebra 2 Honors Unit 5

Marking Period	Unit Title	Recommended Instructional Days
3	Trigonometric Graphs	15-20 days
<b>Domain: Algebra, Functions</b>		
<p><i>NJSLS Strand:</i></p> <p><b>Key:</b></p> <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Major Cluster</li> <li><span style="color: blue;">□</span> Supporting Cluster</li> <li><span style="color: yellow;">○</span> Additional Cluster</li> </ul> <p><span style="color: blue;">□</span> <b>A-CED.A.1</b> Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. 🌱</p> <p><b>A-CED.A.2</b> Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.</p> <p><b>A-CED.A.3</b> Represent constraints by equations or inequalities, and by systems of</p>	<p><i>Progress Indicator:</i> <b>Tests • Quizzes • Practice problems for homework • Online textbook • Worksheets • Leveled assessments</b></p>	<p style="text-align: center;"><b>Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSL-S-CLKS within Unit</b></p> <p><b>Essential Question/s:</b> How does right triangle trigonometry from geometry relate to trigonometric functions? What are the main components used for graphing sinusoids?</p> <p><b>Activity Description:</b> Graph of Sine Graph of Cosine Graph of Tangent</p> <p><b>Interdisciplinary Connections:</b></p> <p><b>Technology:</b> <b>8.2.12.D.1:</b> Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.</p>

equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. **For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.** 🌱

■ **F-IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given in a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.\**

**F-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **For example, if the function  $h(n)$  gives the number of person-hours it takes to assemble  $n$  engines in a factory,**

**Example Tasks:**

**Task 1:**

Find the amplitude, the period in radians, the phase shift in radians, the vertical shift, and the maximum and minimum values. Then sketch the graph using radians.

a)

$$y = 3\sin\left(\theta - \frac{5\pi}{6}\right)$$

b)

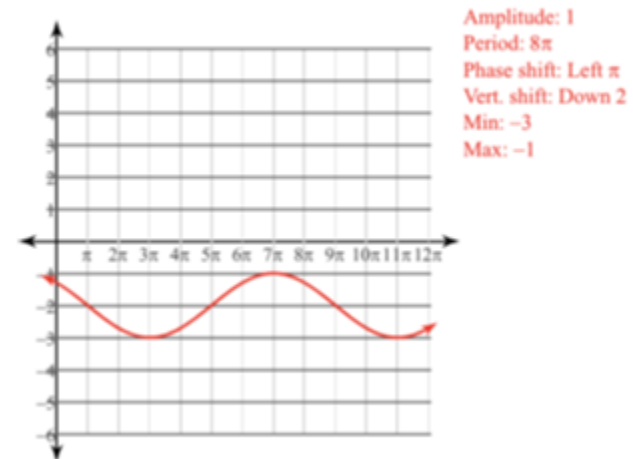
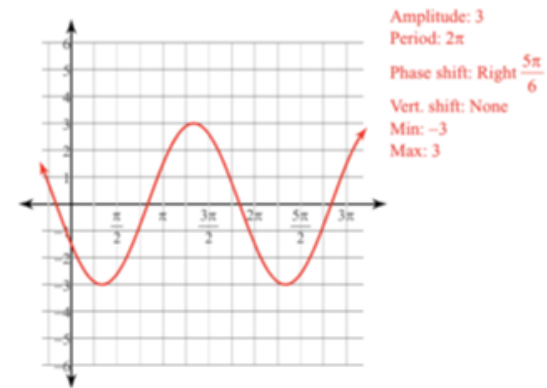
$$y = \cos\left(\frac{\theta}{4} + \frac{\pi}{4}\right) - 2$$

**Answer:**

then the positive integers would be an appropriate domain for the function. ★ 🌱

**F-IF.C.7.** Graph functions expressed symbolically and show key features if the graph, by hand in simple cases and using technology for more complicated cases.\*

- Graph linear and quadratic functions and show intercepts, maxima, and minima
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros, when suitable factorizations are available, and showing end behavior.
- (+) Graph rational functions, identifying zeros, and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercept and end behavior, and



trigonometric functions, showing period, midline, and amplitude.

**F-BF.B.3** Identify the effect on the graph of replacing  $f(x)$  by  $f(x) + k$ ,  $kf(x)$ ,  $f(kx)$ , and  $f(x + k)$  for specific values of  $k$  (both positive and negative); find the value of  $k$  given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*

**F-TF.B.5 (+)** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

**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.

**Task 2:**

Find the transformations required to obtain the graph starting with a basic trig function.

a)  $y = 5\cos\left(\theta + \frac{5\pi}{6}\right)$

b)  $y = 5 + \sin\left(8\theta + \frac{3\pi}{4}\right)$

c)  $y = \sin\left(\theta - \frac{\pi}{6}\right) - 2$

d)  $y = \frac{1}{10} \cdot \tan\left(\theta - \frac{\pi}{3}\right)$

**Answer:**

a) Starting with  $\cos \theta$ ,  
vertically stretch by 5,  
translate left  $\frac{5\pi}{6}$

b) Starting with  $\sin \theta$ ,  
horizontally shrink by  
 $\frac{1}{8}$ , translate left  $\frac{3\pi}{32}$ ,  
translate up 5

c) Starting with  $\sin \theta$ ,  
translate right  $\frac{\pi}{6}$ ,  
translate down 2

d) Starting with  $\tan \theta$ ,  
vertically shrink by  
 $\frac{1}{10}$ , translate right  $\frac{\pi}{3}$

**At the end of each topic please review the Assessment Practice and Performance Tasks questions.**



**ASSESSMENT PRACTICE**

21. Find the key features of the function  $y = 8\cos\left(\frac{\pi}{6}x\right)$ . Write the correct value from the box next to each key feature.

amplitude =

period =

frequency =

midline =

3	8	12
$\frac{1}{8}$	$\frac{1}{12}$	$\frac{\pi}{3}$
$x = 0$		$y = 0$

**Performance Task** Danielle is investigating how the signs of the parameters  $a$  and  $b$  create transformations of the sine function.

**Part A** Graph  $y = \sin(2x)$  and  $y = -\sin(2x)$  on the same coordinate plane.

**Part B** How are the graphs of  $y = \sin(2x)$  and  $y = -\sin(2x)$  related?

**Part C** Graph  $y = \sin(2x)$  and  $y = \sin(-2x)$  on the same coordinate plane.

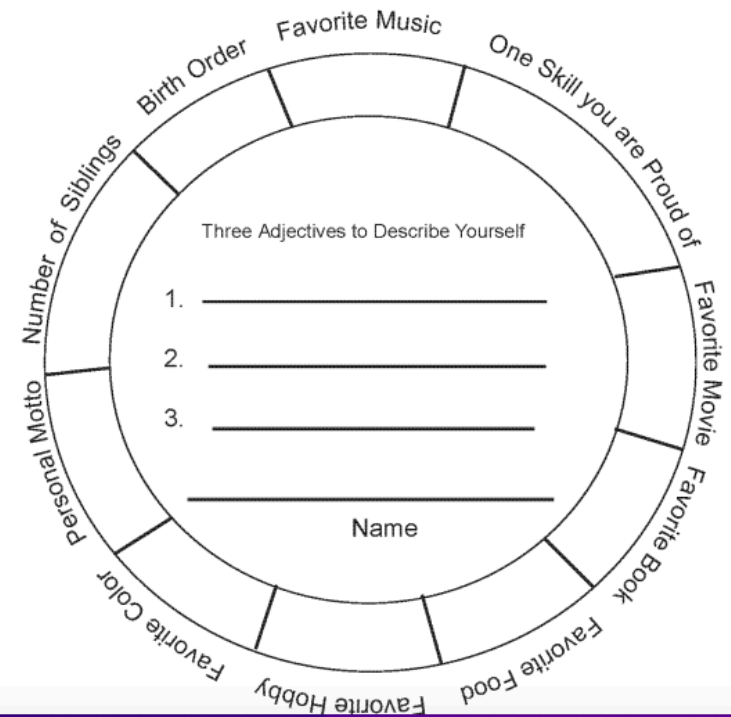
**Part D** How are the graphs of  $y = \sin(2x)$  and  $y = \sin(-2x)$  related?

**Part E** How is the graph of  $y = a \sin(bx)$  affected when  $a$  or  $b$  is replaced with its opposite? Explain.

		<p><b>Spot Light on: Diversity</b> Students should reflect on and discuss the identities that are most important to them. This activity will help students get to know each other better and allow them to express important parts of their identities that may otherwise not be known. Students should be asked to reflect on the value of their identities by considering which of those is most and least important to them and why that may be.</p>
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### Personal Identity Wheel

(Adapted from "Voices of Discovery", Intergroup Relations Center, Arizona State University)



The diagram is a circular 'Personal Identity Wheel' divided into 12 segments. Starting from the top and moving clockwise, the segments are: 'Favorite Music', 'One Skill you are Proud of', 'Favorite Movie', 'Favorite Book', 'Favorite Food', 'Favorite Hobby', 'Favorite Color', 'Personal Motto', 'Number of Siblings', 'Birth Order', and 'Favorite Music'. The center of the wheel contains the text 'Three Adjectives to Describe Yourself' followed by three numbered lines (1., 2., 3.) for writing. Below the center is a line for 'Name'.

Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.

Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations,

		<p>inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.</p> <p>Climate Change Example: Students may relate the domain of a function <math>c(m)</math> representing the amount of carbon dioxide produced by burning <math>m</math> molecules of ethane (gasoline), to its graph in order to determine the appropriate domain for <math>c(m)</math>.</p>
<b>Mathematics Practices</b>		
<ol style="list-style-type: none"> <li>1. Make sense of problems and persevere in solving them.</li> <li>2. Reason abstractly and quantitatively.</li> <li>3. Construct viable arguments and critique the reason of others.</li> <li>4. Model with mathematics.</li> <li>5. Use appropriate tools strategically.</li> <li>6. Attend to precision.</li> <li>7. Look for and make use of structure.</li> <li>8. Look for and express regularity in repeated reasoning.</li> </ol>		
<b>Social and Emotional Learning: <i>Competencies</i></b>	<b>Social and Emotional Learning: <i>Sub-Competencies</i></b>	
<p>Self- awareness</p> <p>Social Awareness</p> <p>Self- Management</p>	<p>Recognizing the importance of self-confidence in handling daily tasks and challenges.</p> <p>Demonstrate an awareness of the expectations for social interactions in a variety of ways.</p>	

<p>Relationship Skills Responsible Decision-Making</p>	<p>Demonstrate an understanding of the need for mutual respect when viewpoints differ. Recognize the skills needed to establish and achieve personal and educational goals. Utilize positive communication and social skills to interact effectively with others. Develop, implement, and model effective problem solving and critical thinking skills.</p>		
<p><b>Assessments (Formative)</b> <i>To show evidence of meeting the standard/s, students will successfully engage within:</i></p>		<p><b>Assessments (Summative)</b> <i>To show evidence of meeting the standard/s, students will successfully complete:</i></p>	
<p><b>Formative Assessments:</b></p> <ul style="list-style-type: none"> <li>• Entry and Exit Slips</li> <li>• Quizzes</li> <li>• Self Assessments</li> </ul>		<p><b>Benchmarks:</b></p> <ul style="list-style-type: none"> <li>• Chapter Tests</li> <li>• Projects</li> </ul> <p><b>Summative Assessments:</b></p> <ul style="list-style-type: none"> <li>• District Assessments</li> <li>• Midterms</li> <li>• Standardized Tests</li> </ul>	
<p><b>Differentiated Student Access to Content: Teaching and Learning Resources/Materials</b></p>			
<p><b>Core Resources</b></p>	<p><b>Alternate Core Resources <i>IEP/504/At-Risk/ESL</i></b></p>	<p><b>ELL Core Resources</b></p>	<p><b>Gifted &amp; Talented Core Resources</b></p>
<ul style="list-style-type: none"> <li>• Savvas Envision</li> <li>• Achieve the core</li> <li>• Khan Academy</li> <li>• Desmos</li> </ul>	<ul style="list-style-type: none"> <li>• Skill building worksheets</li> <li>• Math Manipulatives</li> </ul>	<ul style="list-style-type: none"> <li>• Dictionary for native languages</li> <li>• Videos in their native language.</li> </ul>	<ul style="list-style-type: none"> <li>• Leveled Assessments</li> <li>• Enrichment worksheets</li> </ul>

**Supplemental Resources**

**Technology:**

- Chromebooks, Graphing Calculators, Smartboards

**Other:**

- Zoom and Google Meets, Schoology, Interactive Textbooks

**Differentiated Student Access to Content:  
Recommended *Strategies & Techniques***

Core Resources	Alternate Core Resources <i>IEP/504/At-Risk/ESL</i>	ELL Core Resources	Gifted & Talented Core
<ul style="list-style-type: none"> <li>• Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat</li> </ul>	<ul style="list-style-type: none"> <li>• Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.</li> </ul>	<ul style="list-style-type: none"> <li>• Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of an online bilingual dictionary, and modified assessment and/or rubric.</li> </ul>	<ul style="list-style-type: none"> <li>• Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related</li> </ul>

**Disciplinary Concept: Creativity and Innovation**

<b>NJSLS CAREER READINESS, LIFE LITERACIES &amp; KEY SKILLS</b>	<b>Core Ideas:</b>	Cultivating online reputations for employers and academia requires separating private and professional digital identities.
	<b>Performance Expectation/s:</b>	9.4.12.DC.6: Select information to post online that positively impacts personal image and future college and career opportunities.
	<b>Career Readiness, Life Literacies, &amp; Key Skills Practices</b>	
	<p><b>Act as a responsible and contributing community member and employee.</b>  <b>Attend to financial well-being.</b>  <b>Consider the environmental, social and economic impacts of decisions.</b>  <b>Demonstrate creativity and innovation.</b>  <b>Utilize critical thinking to make sense of problems and persevere in solving them.</b>  <b>Model integrity, ethical leadership and effective management.</b>  <b>Plan education and career paths aligned to personal goals.</b>  <b>Use technology to enhance productivity, increase collaboration and communicate effectively.</b>  <b>Work productively in teams while using cultural/global competence.</b></p>	

New Jersey Legislative Statutes and Administrative Code  
(place an "X" before each law/statute if/when present within the curriculum map)

Amistad Law: <i>N.J.S.A. 18A 52:16A-88</i>		Holocaust Law: <i>N.J.S.A. 18A:35-28</i>		LGBT and Disabilities Law: <i>N.J.S.A. 18A:35-4.35</i>	<b>X</b>	Diversity & Inclusion: <i>N.J.S.A. 18A:35-4.36a</i>	<b>X</b>	Standards in Action: <i>Climate Change</i>
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