FST Name _____

4-7 Scale Change & Trig Date _____ **A#13**

Goal: Apply the scale changes that can be done with the graph of any relation to the graphs of the sine, cosine, and tangent functions, where they have special meaning.

Questions

Review: Considering the Scale-Change Theorem, explain the changes relative to the parent function:

a. $2y = \left(\frac{x}{3}\right)^2$ b. $\frac{y}{-4} = (3x)^3$

Sine Waves

Period:

Amplitude:

Example 1: Consider the equation $y = 6\cos\left(\frac{x}{3}\right)$.

a. Explain its relationship to the parent function $y = \cos x$.

b. Identify its period and amplitude.

Example 2: Consider the equation $y = 3.5\sin\left(\frac{4x}{3}\right)$.

a. Explain its relationship to the parent function $y = \sin x$.

b. Identify its period and amplitude.

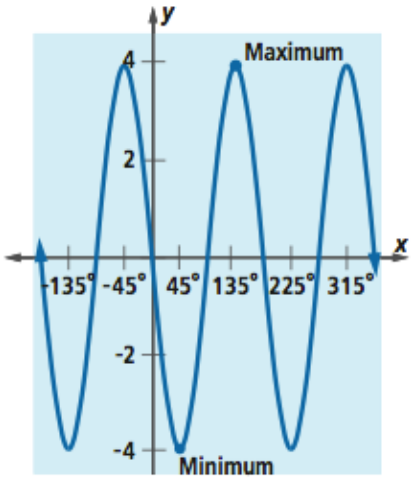
Questions

Theorem (Properties of Sine Waves)

The graphs of the functions defined by $y = b\sin\left(\frac{x}{a}\right)$ and $y = b\cos\left(\frac{x}{a}\right)$ have amplitude $= |b|$ and period $= 2\pi|a|$.

Why must the amplitude be an absolute value?

Example 3: Find the function from the graph.

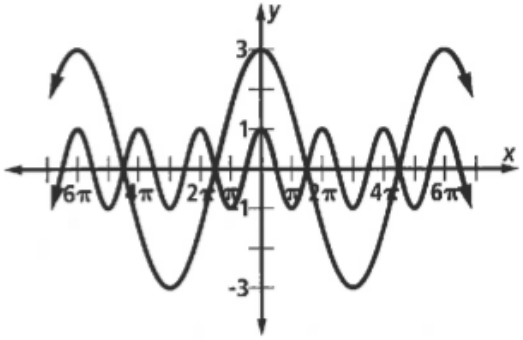


1. Find amplitude:

2. Find period:

3. Narrow down options:

Example 4: The graph below shows $y = \cos x$ and its image under a scale change. Find an equation for the image.



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The Frequency of the Sine Wave

In Example 4, notice that $y = \cos x$ completes _____ cycles for every one cycle the images competes. We say that $y = \cos x$ has _____ times the *frequency*. In general, the frequency of a periodic function is the _____ of the period.

Example 5: A tuning fork vibrates with a frequency of 512 cycles per second. The intensity of the tone is the result of a vibration whose maximum pressure is $22\frac{\text{N}}{\text{m}^2}$. Find an equation to model the sound wave produced by the tuning fork.

Example 6: A tuning fork vibrates with a frequency of 440 cycles per second. The intensity of the tone is the result of a vibration whose maximum pressure is $15\frac{\text{N}}{\text{m}^2}$. Find an equation to model the sound wave produced by the tuning fork.

Questions

Questions

Example 7: Without using technology, determine how many solutions each equation below has on the interval $0 \le x \le 2\pi$. Confirm your answer with a graph.

a. $\cos(3x) = 0.8$

b. $5\tan\left(\frac{x}{2}\right) = 3$

Summary: