

Goal: Consider situations where a composite of translations and scale changes have been applied to a graph.



Questions

Review: Consider the functions $\frac{y}{2} - 4 = \sin x$ and $\frac{y-4}{2} = \sin x$. In regards to amplitude, period, stretches and translations, predict the differences in transformations between the two. What is the same? Check using a graphing calculator. To where does the points (0,0) from the parent function map in the two functions?

The General Idea

Graph-Standardization Theorem

Given a preimage graph described by a sentence in x and y , the following processes yield the same graph:

- (1) replacing x by $\frac{x-h}{a}$ and y by $\frac{y-k}{b}$ in the sentence;
- (2) applying the scale change $(x, y) \rightarrow (ax, by)$ followed by the translation $(x, y) \rightarrow (x+h, y+k)$ to the preimage graph.

Example 1: Explain how the graph of $\frac{y-1}{2} = \cos\left(\frac{x+\pi}{3}\right)$ is related to the graph of the parent function. Identify the amplitude, period, vertical shift and phase shift of this function.

Questions

Example 2: Explain how the graph of $\frac{y+5}{3} = \cos\left(\frac{x-3\pi}{4}\right)$ is related to the graph of the parent function. Identify the amplitude, period, vertical shift and phase shift of this function.

Convert Between Forms

Example 3: Explain how the graph of $y = 2 \sin(3x + \pi)$ is related to the graph of the parent function. Identify the amplitude, period, vertical shift and phase shift of this function.

Questions

Example 4: Explain how the graph of $y = 5 \cos\left(2x - \frac{\pi}{2}\right) - 7$ is related to the graph of the parent function. Identify the amplitude, period, vertical shift and phase shift of this function.

Writing Functions

Example 5: Write a function whose graph will have the given characteristics: parent $y = \sin x$, phase shift $\frac{\pi}{5}$, period π , amplitude 2.

Example 6: Write a function whose graph will have the given characteristics: parent $y = \cos x$, phase shift 180° , period 45° , amplitude $\frac{1}{3}$.

Summary: