

Goal: Extend the transformations of graphs of trigonometric functions to include horizontal and vertical translations.



Questions

Review: Describe the transformations from the parent functions.

a. $y = 2\left(\frac{x}{3}\right)^2$ b. $y - 6 = (x + 3)^2$ c. $y = 15 \sin(-2x)$

Function Form: $\frac{y-k}{a} = f\left(\frac{x-h}{b}\right)$ or
 $y = af\left(\frac{x-h}{b}\right) + k$

Phase Shift

In the lovely world of trigonometric functions, _____
 _____ are called *phase shifts*.

Example 1: What is the phase shift of each function?

a. $y = \cos\left(x + \frac{\pi}{4}\right)$ b. $y = \sin(x - 36^\circ)$ c. $y = \cos\left(x - \frac{\pi}{4}\right)$

Part a in transformation terms:

Example 2: What is the vertical shift of each function?

a. $y = \cos x + 4$ b. $y + 2 = \sin x$ c. $y = \cos x + 15$

Part a in transformation terms:

Questions

Example 3: Consider the function $f(x) = \cos\left(x - \frac{7\pi}{3}\right) - 2$. Find the

following:

- phase shift from parent function:
- vertical shift from parent function:
- the period:
- the amplitude:
- the maximum and minimum values:
- Transformation form

Example 3: Consider the function $f(x) = 2\sin\left(x - \frac{3\pi}{4}\right) + 4$. Find the

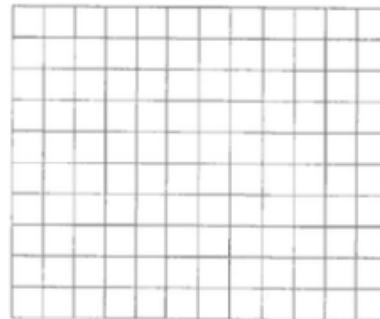
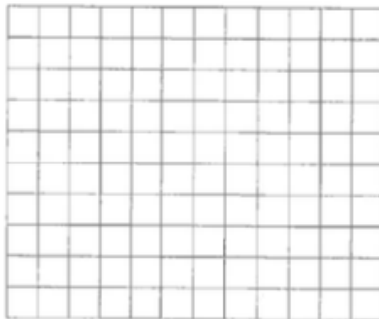
following:

- phase shift from parent function:
- vertical shift from parent function:
- the period:
- the amplitude:
- the maximum and minimum values:
- Transformation form:

Example 4: Sketch the graph of each function.

a. $f(x) = \sin\left(2x + \frac{\pi}{3}\right) + 1$

b. $y - 3 = \cos\left(x - \frac{\pi}{4}\right)$

**Summary:**

Graph the following functions. Identify the amplitude, period, and translation.

5. $y = \sin x + 2$

6. $y = \cos x - 3$

7. $y = \tan x + 4$



8. $y = 3 \sin x - 1$

9. $y = -2 \cos x + 3$

10. $y = \frac{1}{2} \cos x - 1$



11. $y = 3 \tan x + 2$

12. $y = -\frac{1}{4} \sin x + 4$

13. $y = -\cos x - 3$

