

Name:

Period:

Date:

Math Lab: Explore Transformations of the Sine Function

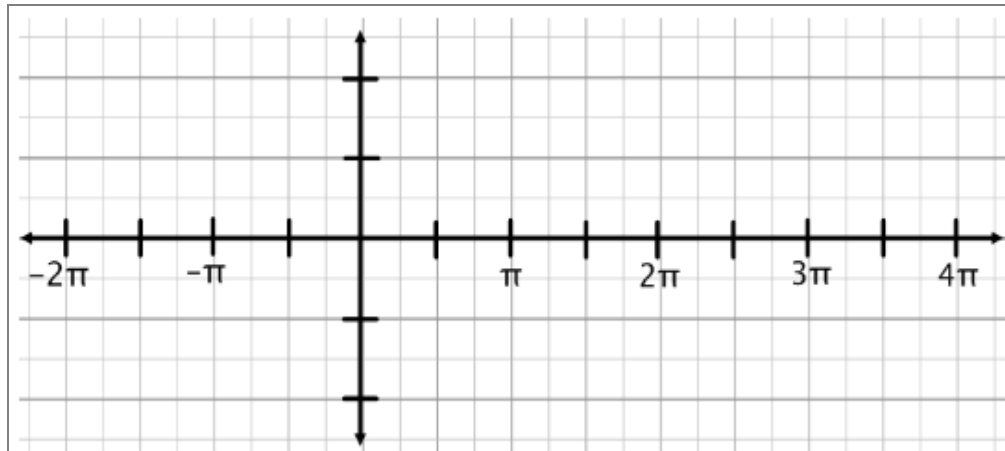
QUESTION

How do vertical displacement, phase shift, reflection, changes in amplitude, and changes in period affect the parent graph of a trigonometric function?

EXPLORE VERTICAL DISPLACEMENT

1. Graph each function in the given color and calculate its period.

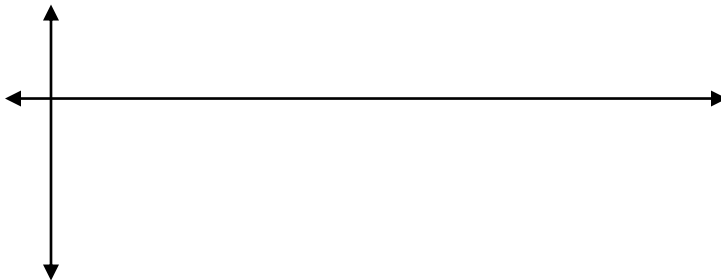
$$y = \sin x \text{ (red)}, \quad y = \sin(x) + 1 \text{ (blue)}, \quad y = \sin(x) - 1 \text{ (green)}$$



2. Explain what happens to the graph when a constant is added to the sine function.
3. Explain what happens to the graph when a constant is subtracted from the sine function.
4. In the standard form of the sine function, what variable represents vertical displacement?

$$y = a \sin b(x - h) + k$$

5. Sketch the graph of $y = \cos x - 2$ over the interval $[0, 2\pi]$.

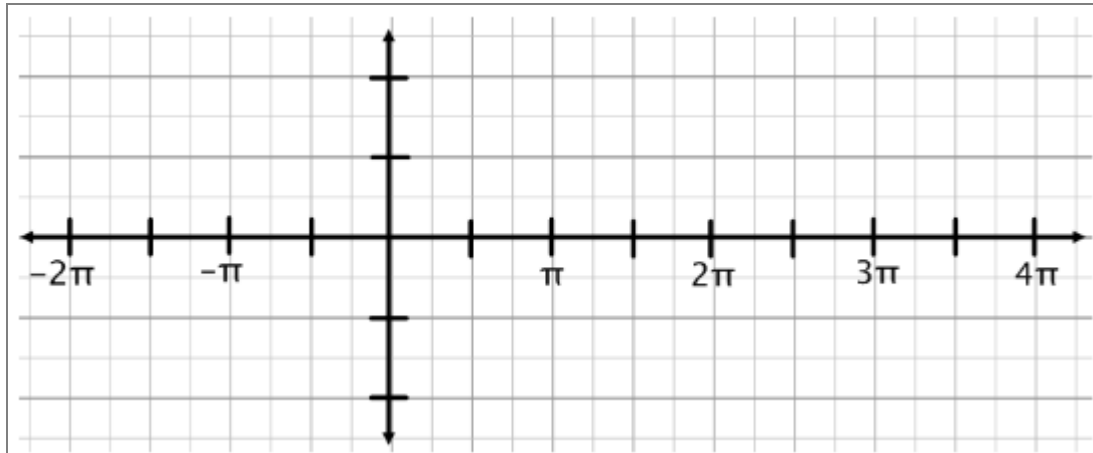


6. Describe the transformation taking place in the graph of $y = \tan x - 5$.

EXPLORE PHASE-SHIFT

7. Graph each function in the given color and calculate its period.

$$y = \sin x \text{ (red)}, \quad y = \sin\left(x - \frac{\pi}{2}\right) \text{ (blue)}, \quad y = \sin\left(x + \frac{\pi}{2}\right) \text{ (green)}$$



8. Explain what happens to the graph when a constant is added to the x in the sine function.
9. Explain what happens to the graph when a constant is subtracted from the x in the sine function.
10. In the standard form of the sine function, what variable represents **phase shift**?

$$y = a \sin b(x - h) + k$$

11. Sketch the graph of $y = \cos(x - \pi) + 1$ over the interval $[0, 2\pi]$.

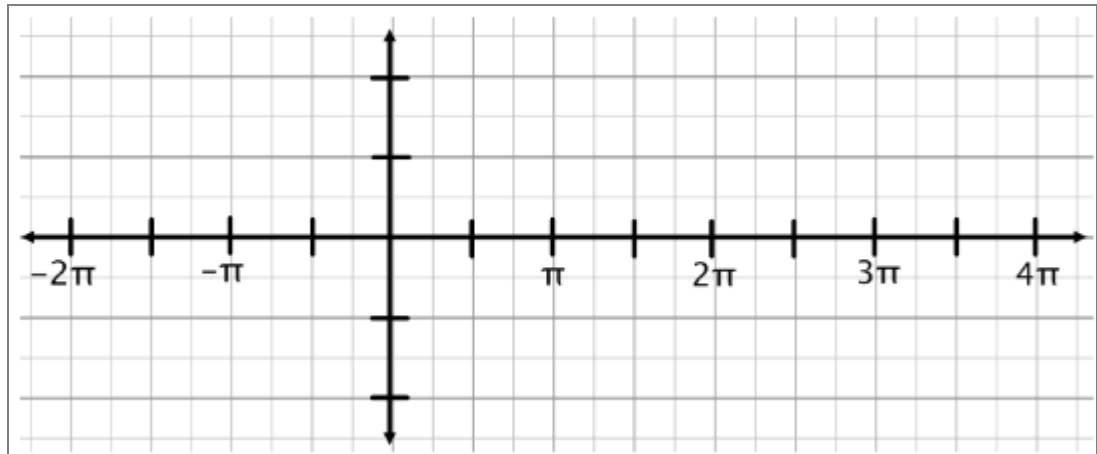


12. Describe the transformations taking place in the graph of $y = \tan\left(x + \frac{\pi}{4}\right) - 3$.

EXPLORE REFLECTION

13. Graph each function in the given color and calculate its amplitude.

$$y = \sin x \text{ (red)}, \quad y = -\sin x \text{ (blue)}$$



14. Explain what happens to the graph when the sine function is negative.

15. In the standard form of the sine function, what variable represents **reflection**?

$$y = a \sin b(x - h) + k$$

16. Sketch the graph of $y = -\cos x + 2$ over the interval $[0, 2\pi]$.



17. Describe the transformations taking place in the graph of $y = -\tan\left(x - \frac{\pi}{6}\right) + 1$.

EXPLORE AMPLITUDE

18. Graph each function in the given color and calculate its amplitude.

$$y = \sin x \text{ (red),}$$

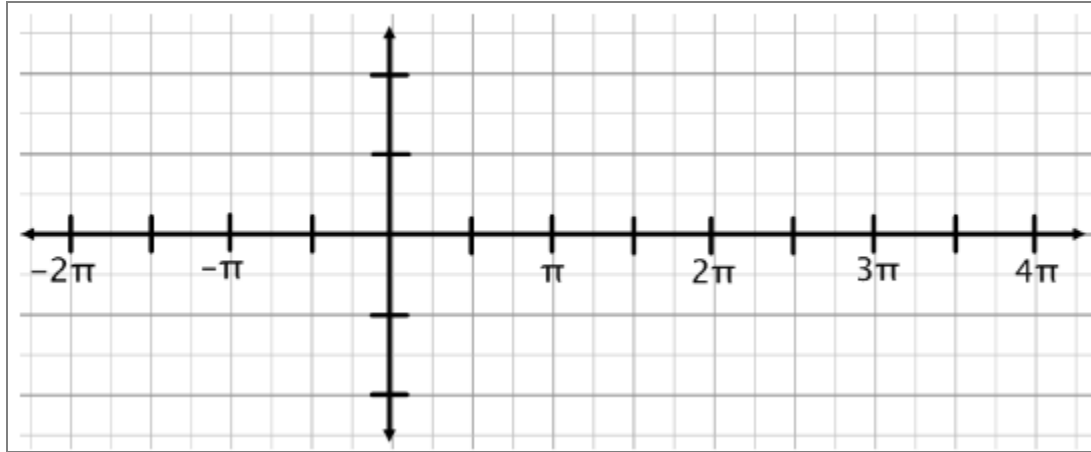
$$y = 2 \sin x \text{ (blue),}$$

$$y = \frac{1}{2} \sin x \text{ (green)}$$

amplitude =

amplitude =

amplitude =



19. Explain what happens to the graph of a sine function when it is multiplied by a constant greater than 1.

20. Explain what happens to the graph of a sine function when it is multiplied by a constant between 0 and 1.

21. In the standard form of the sine function, what variable represents **amplitude**?

$$y = a \sin b(x - h) + k$$

22. Sketch the graph of $y = 3\cos(x - \pi)$ over the interval $[0, 2\pi]$.



23. Describe the transformations taking place in the graph of $y = -\frac{1}{2}\sin x - 3$.

EXPLORE PERIOD

24. Graph each function in the given color and calculate its period.

$$y = \sin x \text{ (red),}$$

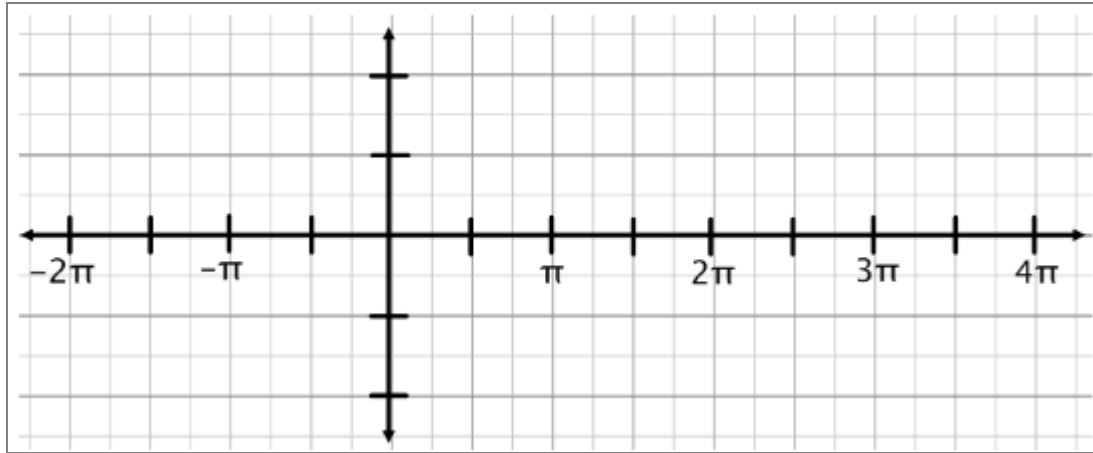
period =

$$y = \sin(2x) \text{ (blue),}$$

period =

$$y = \sin\left(\frac{1}{2}x\right) \text{ (green)}$$

period =



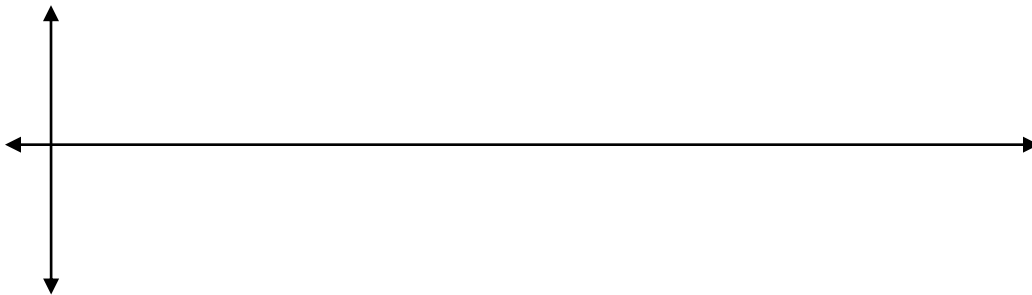
25. Explain what happens to the period of a sine function when the angle is multiplied by a constant greater than 1.

26. Explain what happens to the period of a sine function when the angle is multiplied by a constant between 0 and 1.

27. In the standard form of the sine function, what variable impacts **period** and in what way?

$$y = a \sin b(x - h) + k$$

28. Sketch the graph of $y = 3\cos 3x$ over the interval $[0, 2\pi]$.



29. Describe the transformations taking place in the graph of $y = \tan(3x - \pi) + 2$.