

## Graphing Sine Activity

### Overview

This VI captures the relationship between algebraic and graphic representations of transformations of the Sine function. This VI graphs a sinusoid function,  $y = C + A \sin B(x - D)$ , where the parameters  $A$  through  $D$  control the **vertical displacement**, **amplitude**, **frequency**, and **phase displacement** of the graph.

In this simple activity, manipulation of the vertical displacement, phase displacement, amplitude, and frequency values can be used to aid students in developing a both a mathematical and conceptual understanding of wave characteristics.

### Objectives

Students will be able to:

- Manipulate the amplitude, frequency, vertical displacement, and phase displacement of a wave and observe the effects on the sine wave equation

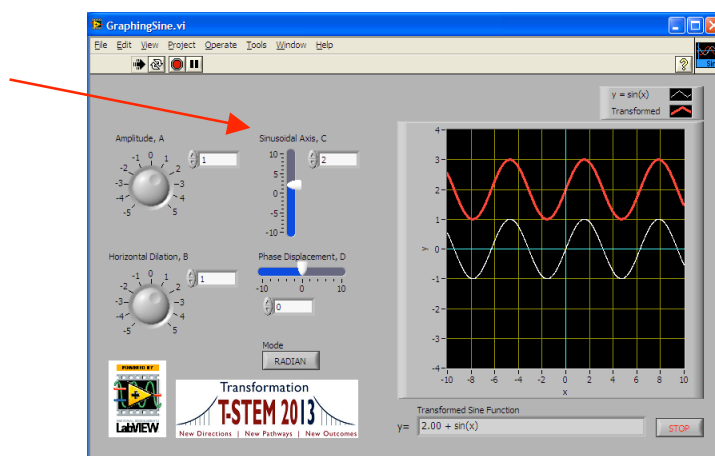
### Standards (TEKS)

IPC 5A

Physics 8AC

### Activity

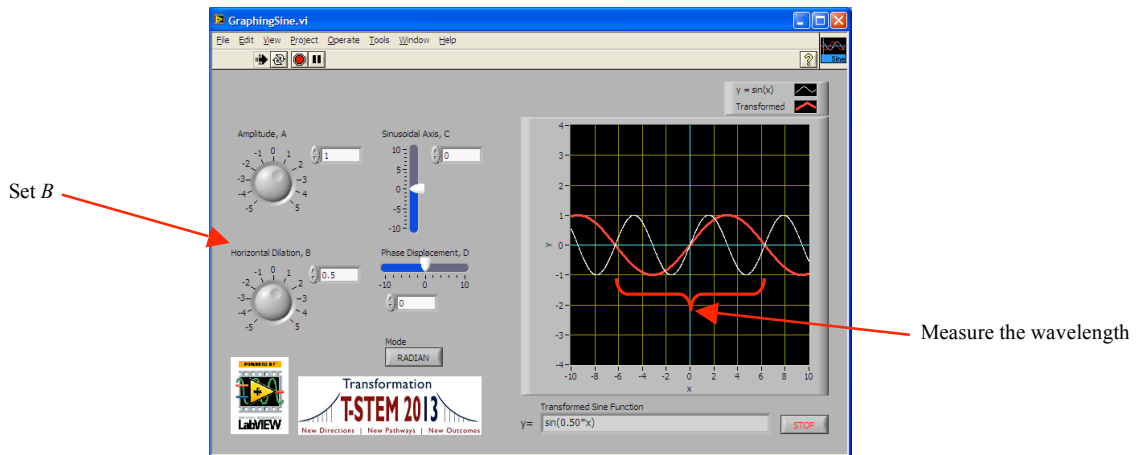
- 1) Open and run the VI.
- 2) Record the general equation of the sine wave shown above: \_\_\_\_\_
- 3) Manipulate the **sinusoidal axis** of the wave.
  - a) What happens on the graph?
  - b) Circle the value in the sine wave equation in #2 that changes.



- 4) Manipulate the **phase displacement** of the wave.
  - a) What happens on the graph?
  - b) Draw a square around the value in the sine wave equation in #2 that changes.
- 5) Manipulate the **amplitude** of the wave.
  - a) What happens on the graph?
  - b) Draw a triangle around the value in the sine wave equation in #2 that changes.
- 6) Manipulate the **horizontal dilation** of the wave.
  - a) What happens on the graph?
  - b) Describe how this affects the frequency and **wavelength**.
  - c) Highlight the value in the sine wave equation in #2 that changes.

**Frequency** is the number of times the sine pattern repeats per unit of time. If we think of the x-axis as the time axis, then the frequency is simply one divided by the length of one cycle of the graph. That is,

$$f = \frac{1}{\text{wavelength}}.$$



Instead of measuring the wavelength, there is a formula you can use for frequency:

$$f = \frac{B}{2\pi}.$$

- 7) Do the two formulas give you about the same value for the frequency of your graph?
- 8) How does frequency affect the pitch of a sound? (Research on internet)
  - a) What is the frequency of a standard A note above middle C on a piano?
  - b) Calculate the value for  $B$  to graph a sine wave with the frequency of an A note?
- 9) How is amplitude of a wave related to its energy?
- 10) In a stereo sound system, in terms of sound waves, what is the role of an amplifier?