

Periodic Transformations

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Activity overview

This is an activity intended to help students review and understand transformations of the sine and cosine functions. They will work with amplitude, frequency, phase shift and vertical shift to match a function to a scatter plot.

Concepts

Given a function in the form: $f(x)=a\sin(b(x-h))+k$, students will understand the effect of $a,b,h,$ and k on the graph of a function compared to a parent functions: $f(x)=\sin(x)$ and $f(x)=\cos(x)$. They will recognize sine and cosine parent functions on sight.*

Teacher preparation

Transfer the file `periodictransformations.tns` to student calculators.

Classroom management tips

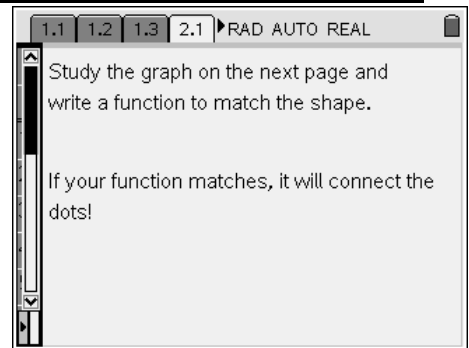
At the beginning of class, review a few navigating steps such as how to go from page to page and from split screen to split screen. Several of the pages (2.1, 3.1, and 4.3) are actually split screens with the spreadsheet part hidden behind the notes page. It is not intended for students to see the spreadsheet. Students may need to be directed to press `ctrl` and `tab` to actually be on the notes page.

TI-Nspire Applications

This activity uses spreadsheets and lists, graphing and notes pages, including the Q& A format.

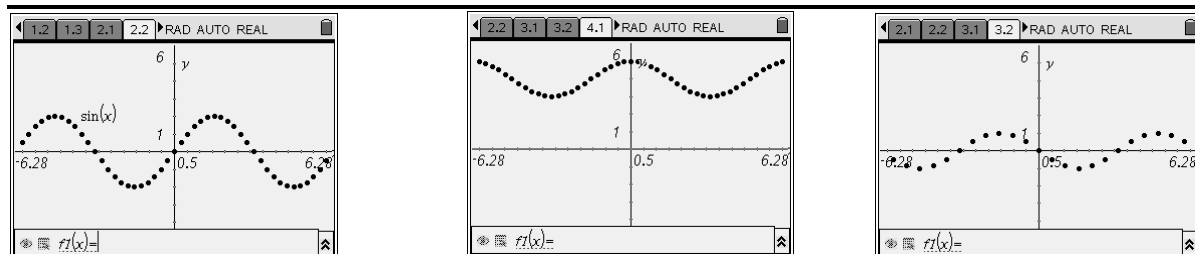
Step-by-step directions

After transferring the activity to calculators, have the students open the file `periodictransformations.tns`. Depending on the students experience with TI Nspire, you may want to preview the activity to give them tips on getting around within the document. One way to type a function is on the function line. The other is by using a text box to type in the expression and then dragging it to either axis. The activity is set up to have students type their answers on the TI Nspire, or you may have them answer with pencil and paper.



Assessment and evaluation

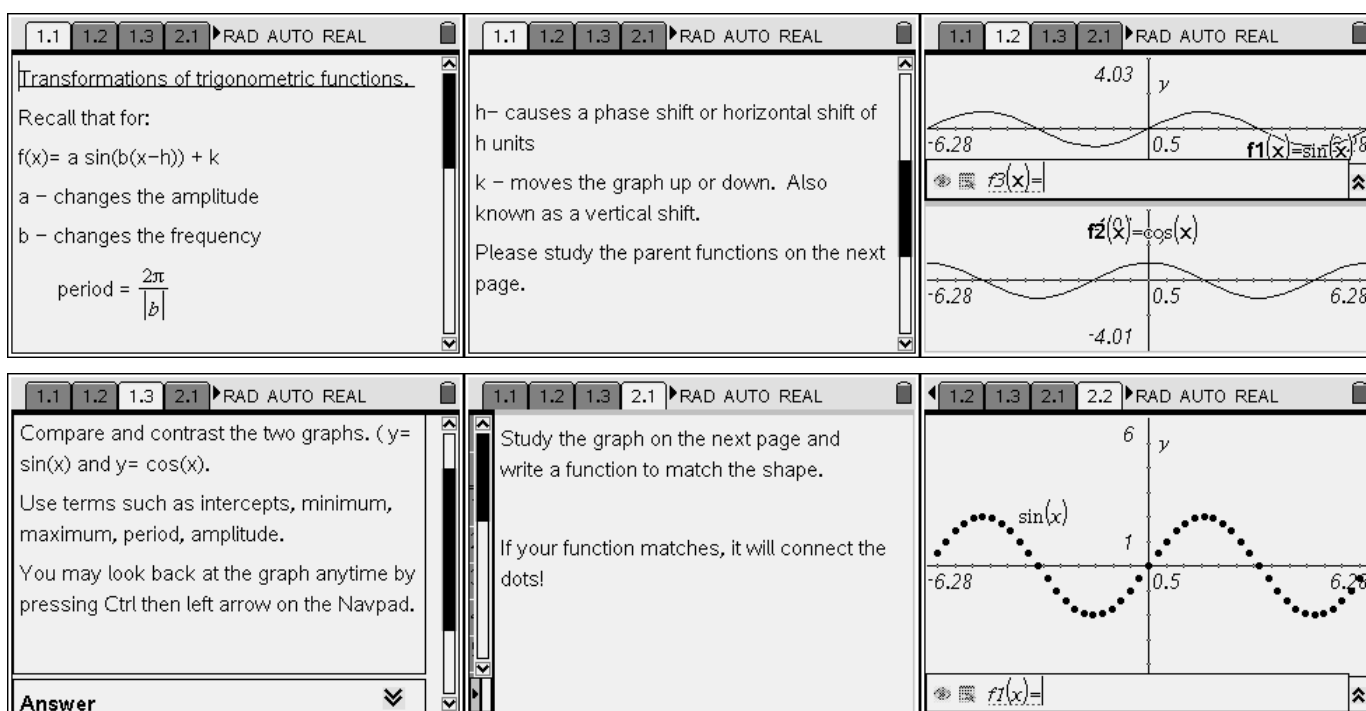
Give students a set time to finish the activity and then require them to hold a discussion and compare the functions they used to match the graph to each other.



Student TI-Nspire Document

periodictransformations.tns

Please open the file *periodictransformations.tns*. Then read and do the activity on your TI Nspire. The activity is intended to be paperless, so you will type your answers directly into your TI Nspire. Here are some pictures of the first few screens, just to make sure you have the correct file open.



The image displays four screenshots from a TI-Nspire document, arranged in a 2x2 grid. Each screenshot shows a different page of the document with text, equations, and graphs.

Top-Left Screenshot: The title bar shows navigation tabs 1.1, 1.2, 1.3, and 2.1. The page title is "Transformations of trigonometric functions." The text reads: "Recall that for: $f(x) = a \sin(b(x-h)) + k$. a - changes the amplitude. b - changes the frequency. $\text{period} = \frac{2\pi}{|b|}$ "

Top-Middle Screenshot: The title bar shows navigation tabs 1.1, 1.2, 1.3, and 2.1. The text reads: "h - causes a phase shift or horizontal shift of h units. k - moves the graph up or down. Also known as a vertical shift. Please study the parent functions on the next page."

Top-Right Screenshot: The title bar shows navigation tabs 1.1, 1.2, 1.3, and 2.1. It displays two graphs. The top graph is labeled $f1(x) = \sin(x)$ and has a y-axis value of 4.03. The bottom graph is labeled $f2(x) = \cos(x)$ and has a y-axis value of -4.01. Both graphs have x-axis values of -6.28, 0.5, and 6.28.

Bottom-Left Screenshot: The title bar shows navigation tabs 1.1, 1.2, 1.3, and 2.1. The text reads: "Compare and contrast the two graphs. ($y = \sin(x)$ and $y = \cos(x)$). Use terms such as intercepts, minimum, maximum, period, amplitude. You may look back at the graph anytime by pressing Ctrl then left arrow on the Navpad. Answer" (with a dropdown arrow).

Bottom-Middle Screenshot: The title bar shows navigation tabs 1.1, 1.2, 1.3, and 2.1. The text reads: "Study the graph on the next page and write a function to match the shape. If your function matches, it will connect the dots!"

Bottom-Right Screenshot: The title bar shows navigation tabs 1.2, 1.3, 2.1, and 2.2. It displays a graph of a sine wave with dots connected by a line. The y-axis has a value of 6. The x-axis has values of -6.28, 0.5, and 6.28. The graph is labeled $\sin(x)$. Below the graph is a text entry field for $f3(x) =$.