**Activity 6.4.2 Stretch It! Trig**



In this activity, we will be exploring the transformations that can be imposed upon the sine, cosine and tangent functions. Understanding, not memorizing, what graphical changes happen will be a key to understanding transformations on all families of functions as discussed in Unit 1.

1. Explore what happens to the parent function  when it is multiplied by the parameter “k” creating a new function . Notice that k is “outside” of the function, and “k” is multiplying the function.



1. For the parent function f(x) = sin(x) and the new function g(x) = 2.5sin(x) fill in the table for these 5 points, plot the points and graph both functions, f(x) and g(x).

|  |  |  |
| --- | --- | --- |
| *x* | f(x)=sin(x) | g(x)=2.5sin(x) |
| 0 |  |  |
|  |  |  |
| π |  |  |
|  |  |  |
| 2π |  |  |



1. Sketch a graph of f(x) = cos(x) and g(x) =cos(x) on the same axis.



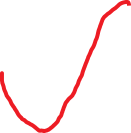
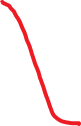
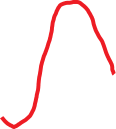
|  |  |  |
| --- | --- | --- |
| *x* | f(x)=cos(x) | g(x)=cos(x) |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. Graph and .



|  |  |  |
| --- | --- | --- |
| *x* | f(x)=sin(x) | h(x)=-sin(x) |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. Graph and .



|  |  |  |
| --- | --- | --- |
| *x* | f(x)=cos(x) | j(x)=-3cos(x) |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |



1. Graph and .



|  |  |  |
| --- | --- | --- |
| *x* | f(x)=sin(x) | h(x)=(x) |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. Make a conjecture about how the value of transforms the graph of *f*(*x*) to the graph of *g* , when is multiplied on the “outside” of the function. Be sure your conjecture holds whether the absolute value of k is less than 1 or greater than 1. Describe how f(x) is affected when k is negative.
2. Explore what happens to the parent function  when the parameter ‘k’ multiplies x (not ‘f’). The new function is , where k multiplies the input of the function.

Graph together with .



|  |  |  |
| --- | --- | --- |
| *x* |  |  |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| π |  |  |
|  |  |  |
|  |  |  |
| 2 |  |  |



1. What is the period of g(x) = sin(2x)?
2. Did the parameter 2 affect the horizontal or the vertical aspect of the graph?
3. Did the parameter 2 shift, stretch or shrink the graph?
4. By how much?
5. The period of the graph of the parent function is 2π. How many full periods of the function g(x) = sin(2x) fit into 2π?
6. We can write the above question as “what is 2π divided by 2”:
7. Sketch the graph of and .

|  |  |  |
| --- | --- | --- |
| *x* | *=* |  |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |



1. What is the period of g(x) =?
2. Did the parameter  affect the horizontal or the vertical aspect of the graph?
3. Did the parameter  shift, stretch or shrink the graph?
4. By how much?
5. The graph of the parent function is 2π. How many full periods of the function

g(x) = sin(x) fit into 2π?

1. We can write the above question as what is 2π divided by 2:



Sketch the graph of and .



|  |  |  |
| --- | --- | --- |
| *x* | *=* |  |
| 0 |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |



1. What is the period of g(x) =?
2. Did the parameter affect the horizontal or the vertical aspect of the graph?
3. Did the parameter shift, stretch or shrink the graph?
4. By how much?
5. The graph of the parent function is 2π. How many full periods of the function

g(x) = cos(x) fit into 2π?

1. We can write the above question as what is 2π divided by :
2. Make a conjecture about how the value of transforms the graph of *f*(*x*) to the graph of *g* , when is multiplied on the “inside” of the function. Be sure your conjecture holds whether the absolute value of k is less than 1 or greater than 1.
3. Generalize what you learned about and to graph two full periods of the following functions using translations and transformations. Suggestion: before you sketch the wave, determine the midline, the maximum and the minimum values. Sketch in the dotted horizontal lines for the midline, y = maximum value and y = minimum value. Next, determine the period. On the midline, plot the 3 points at the beginning of a period, the end of the period, and halfway through the period. Determine the amplitude for each function.























