

Tutorial: Graphing the Sine Function**Slide 1:**

In this tutorial we will generate the graph of the sine function, define the domain and range, find the y-intercept, and find the x-intercepts.

Slide 2:

In order to generate the graph of the sine curve, let's start with positive values of x and, using our calculators, find the corresponding y -values. So that we can get a good picture of what the graph looks like, we will choose 10 positive values of x and then 10 negative values of x . Let's use values in increments of 30 degrees.

Starting with x equals 0, find the sine of 0. This equals 0.

Next x equals 30 degrees, find the sine of 30. This equals 0.5, or one-half.

Next x equals 60 degrees, find the sine of 60. This equals 0.866.

Next x equals 90 degrees, find the sine of 90. This equals 1.

Next x equals 120 degrees, find the sine of 120. This equals 0.866.

Next x equals 150 degrees, find the sine of 150. This equals 0.5, or one-half.

Next x equals 180 degrees, find the sine of 180. This equals 0.

Next x equals 210 degrees, find the sine of 210. This equals negative 0.5, or negative one-half.

Next x equals 240 degrees, find the sine of 240. This equals negative 0.866.

Next x equals 270 degrees, find the sine of 270. This equals negative 1.

Next x equals 300 degrees, find the sine of 300. This equals negative 0.866.

Slide 3:

Now let's do the same thing to find the y -values when the x -values are negative. Again, let's use 10 x -values in increments of 30 degrees. Take a minute to fill in this chart on your own and then go to the next slide to check your values.

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The sine of negative 30 degrees is negative 0.5.

The sine of negative 60 degrees is negative 0.866.

The sine of negative 90 degrees is negative 1.

The sine of negative 120 degrees is negative 0.866.

The sine of negative 150 degrees is negative 0.5.

The sine of negative 180 degrees is 0.

The sine of negative 210 degrees is 0.5.

The sine of negative 240 degrees is 0.866.

The sine of negative 270 degrees is 1.

The sine of negative 300 degrees is 0.866.

Slide 5:

Now that we have all of these points, let's plot them to see what the curve looks like. Use a graph with the x -axis labeled in increments of 30 degrees and the y -axis labeled in increments of one-half.

Let's plot a few points together. Starting with the x equals 0; the corresponding y -value is 0. This is the point (0, 0).

The next x -value is 30 degrees; the corresponding y -value is 0.5. This is the point (30, 0.5).

The next x -value is 60 degrees; the corresponding y -value is 0.866. This is the point (60, 0.866).

The next x -value is 90 degrees; the corresponding y -value is 1. This is the point (90, 1).

Finish plotting the rest of the points to the right and the points to the left. Once you have plotted them all, go to the next slide to check your work.

Slide 6:

Take a look at this graph and check your own. Is it accurate?

Once you have checked your points, let's connect the points to see what the sine curve looks like.

Slide 7:

This is the graph of the sine curve. Notice that it goes up and down repeatedly. If we were to continue to plot points, we would see the same pattern continue over and over again.

What is the domain of this function? Recall that the domain is all the possible x -values. In this case, it appears as though this function is defined for all values of x . The domain is all real numbers.

What is the range of this function? Recall that the range is all the possible y -values. Notice that the highest this function goes is y equals 1 and the lowest it goes is y equals negative 1. The range of this function is y is greater than or equal to negative 1 and less than or equal to 1.

What is the y -intercept? This is the point where it crosses the y -axis. Notice that it crosses the y -axis at y equals 0.

What are the x -intercepts? These are the points where it crosses the x -axis. Notice that it crosses the x -axis at 0 degrees, 180 degrees, 360 degrees. It also crosses at negative 180 degrees and negative 360 degrees. In other words, it crosses the x -axis at all multiples of 180 degrees.

Slide 8:

Remember, the graph of the sine curve is oscillating (up and down) and continues in this fashion indefinitely, the domain is all real numbers, the range is y is greater than or equal to negative 1 and less than or equal to 1, the curve crosses the y -axis at $y = 0$, and the curve crosses the x -axis at all multiples of 180° .

You will be doing the same activity with both the tangent function and the cosine function. You should know this information about all three functions.