

Graphing Trigonometric Functions

Aim

To demonstrate how to graph trigonometric functions.

Learning Outcomes

At the end of this section you will be able to:

- Form ordered pairs to assist in the plotting of trigonometric functions,
- Graph the Sine, Cosine and Tangent Functions.

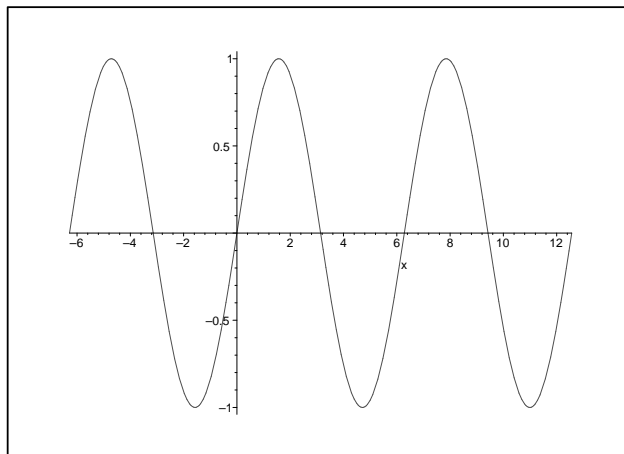
Graphing trigonometric functions is done in exactly the same manner as graphing normal functions, i.e. forming a table of ordered pairs, plotting the pairs and then joining the pairs with a smooth curve.

The Graph of the Sine Function

Graph the sine function over the domain $0 \leq x \leq 2\pi$. To do this we divide the domain into a number of segments and find for each x value a corresponding unique y value. We then plot this ordered pair on the graph. This results, when choosing only 8 points, are shown in the following table.

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$y = \sin x$	0	0.7071	1	0.7071	0	-0.7071	-1	-0.7071	0

The following is the graph of the sine function over the interval $[-2\pi, 4\pi]$.

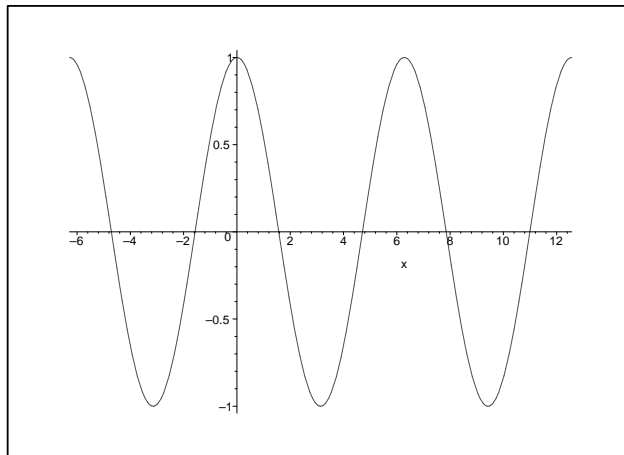


The Graph of the Cosine Function

The following is the table of ordered pairs needed to plot the cosine function over the domain $0 \leq x \leq 2\pi$.

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
$y = \cos x$	1	0.7071	0	-0.7071	-1	-0.7071	0	0.7071	1

The following is the graph of the cosine function over the interval $[-2\pi, 4\pi]$.

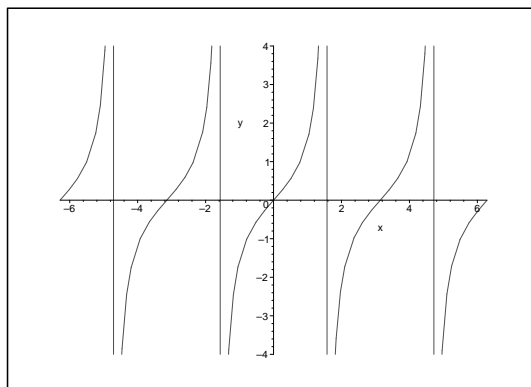


The Graph of the Tangent Function

The following is the table of ordered pairs needed to plot the tangent function over the domain $-\pi \leq x \leq \pi$.

x	$-\pi$	$-\frac{3\pi}{4}$	$-\frac{\pi}{2}$	$-\frac{\pi}{4}$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π
$y = \tan x$	0	1	∞	-1	0	1	∞	-1	0

The following is the graph of the tan function over the interval $[-2\pi, 2\pi]$.



In this case it may be necessary to choose more x values so that we achieve a more accurate graph of the function. Notice that as x approaches $\dots, \pm\frac{\pi}{2}, \pm\frac{3\pi}{2}, \dots$, y tends to $\pm\infty$. The function $y = \tan x$ is periodic, with period π . The functions sine and cosine are also periodic, as can be seen from the graphs, but in these cases the period is 2π .

Related Reading

Croft, A., R. Davison. 2003. *Foundation Mathematics*. 3rd Edition. Pearson Education Limited.

Morris, O.D., P. Cooke. 1992. *Text & Tests 4*. The Celtic Press.