

Transformation of trigonometric functions

$y=\sin(x)$		$y=\cos(x)$		$y=\tan(x)$	
x	y	x	y	x	y
0	0	0	1	$-\pi/2$	undef
$\pi/2$	1	$\pi/2$	0	$-\pi/4$	-1
π	0	π	-1	0	0
$3\pi/2$	-1	$3\pi/2$	0	$\pi/4$	1
2π	0	2π	1	$\pi/2$	undef

Trig transformation formula

$$y = a \sin b(x - c) + d$$

$$y = a \cos b(x - c) + d$$

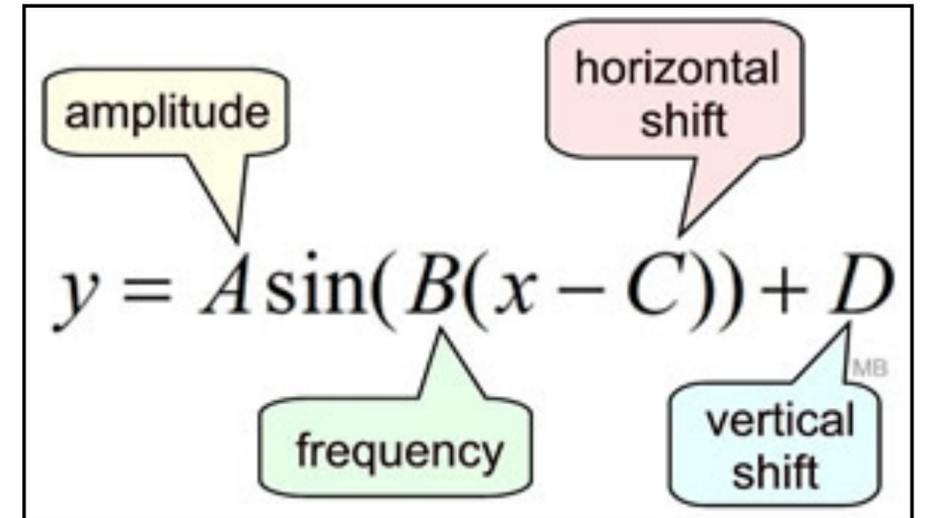
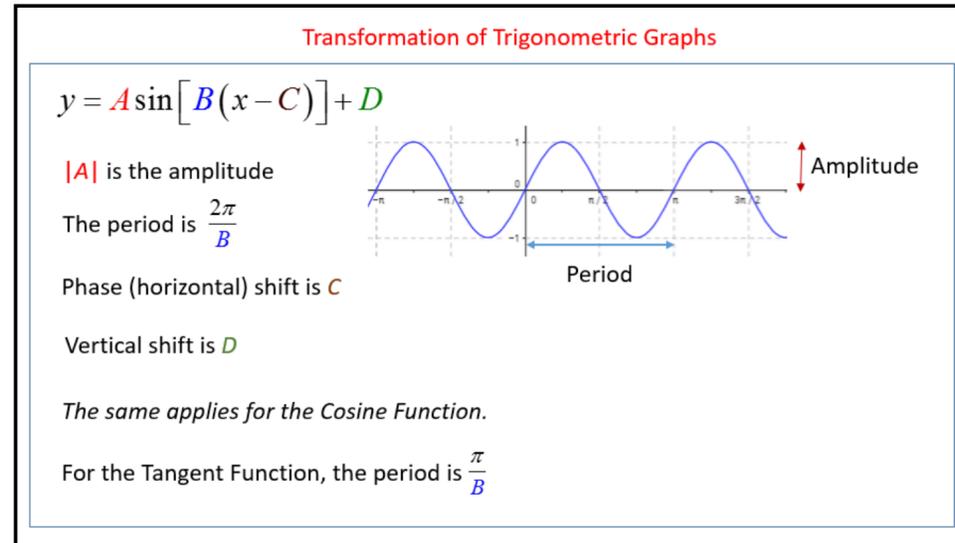
Others:

$$y = a \csc b(x - c) + d$$

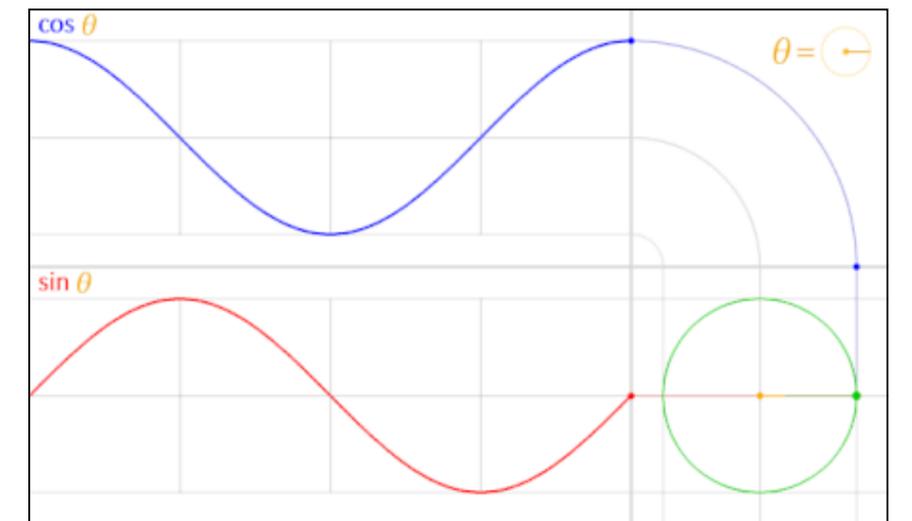
$$y = a \sec b(x - c) + d$$

$$y = a \tan b(x - c) + d$$

$$y = a \cot b(x - c) + d$$



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The graphs of the six basic trigonometric functions can be transformed by adjusting their amplitude, period, phase shift, and vertical shift.

Amplitude of Trigonometric Functions

The amplitude of a trigonometric function is the maximum displacement on the graph of that function. In other words this is how far up and down the graph goes from the middle: think “stretch” if $a > 1$ or “compression” if $a < 1$. For the sine and cosine graphs, the amplitude is the highest y value minus the lowest y value, divided by 2.

The other trig functions (tangent, cotangent, secant, and cosecant) do not have an amplitude.

Period of Trigonometric Functions

The period of a function is the displacement of x at which the graph of the function begins to repeat. Remember that the period is the length of one complete circle of the graph. It follows for the sin, cos, csc and sec graphs that $b = 2\pi / \text{new period}$ and $\text{new period} = 2\pi / b$. For tan and cot, since normally the period is π , we have $b = \pi / \text{new period}$ and $\text{new period} = \pi / b$.

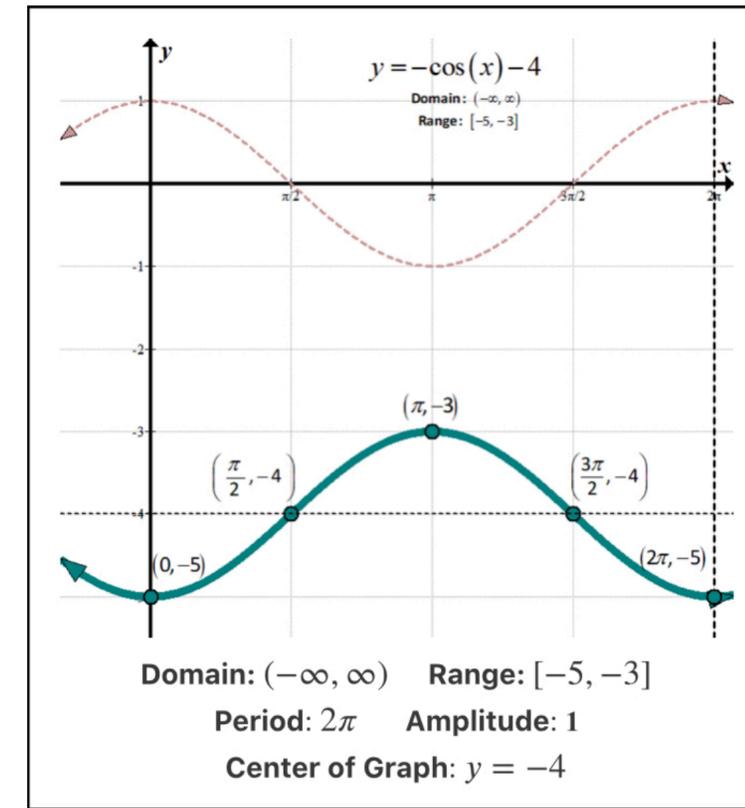
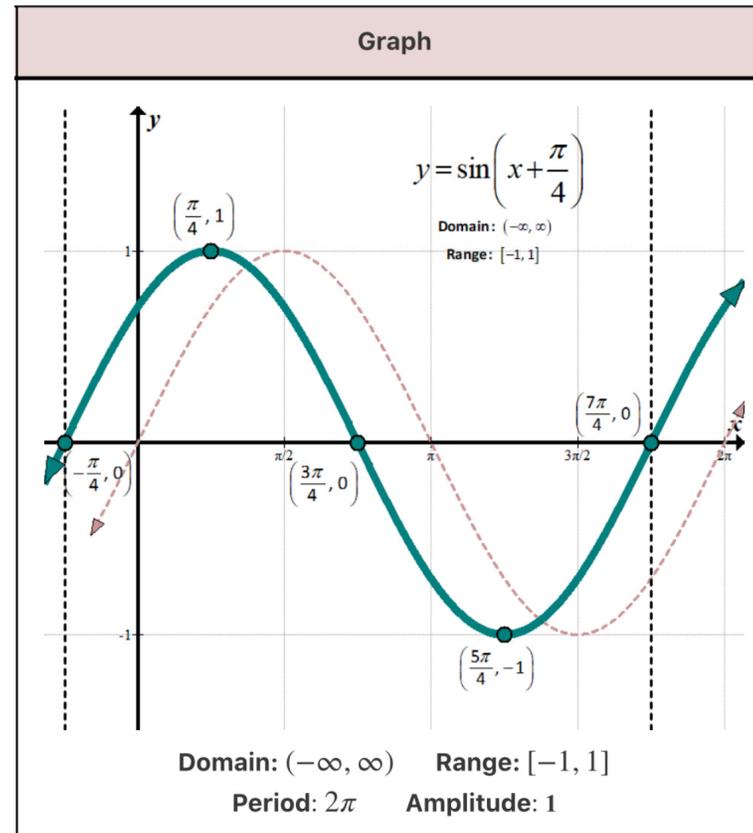
Phase Shift of Trigonometric Functions

The general form for the equation of the sine trigonometric function is $y = A \sin B(x + C)$ where A is the amplitude, the period is calculated by the constant B , and C is the phase shift or horizontal shift. When C is positive, the graph will appear to shift to the right. When C is negative, the graph will shift to the left.

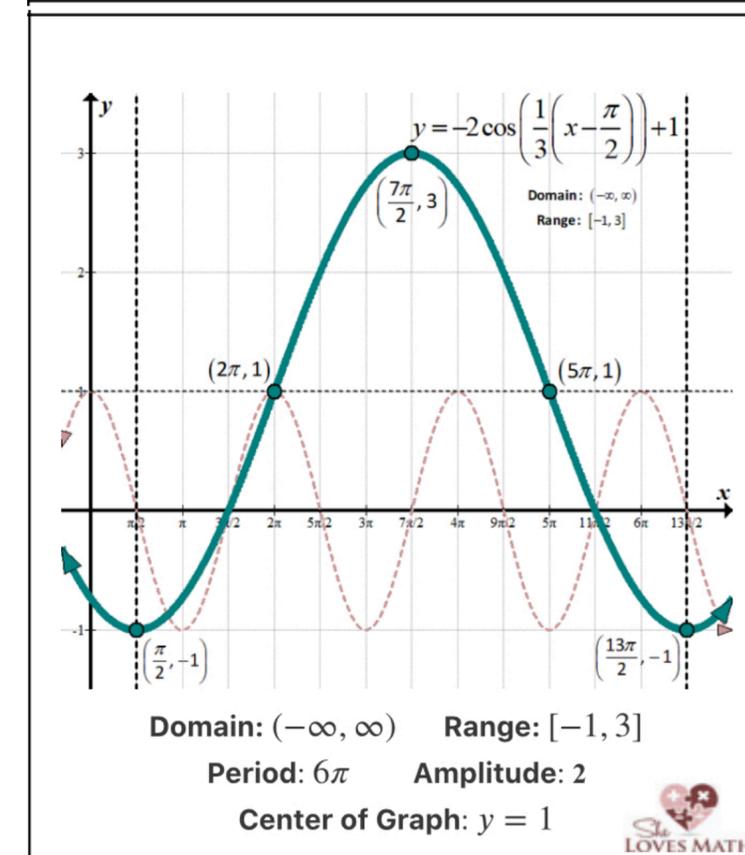
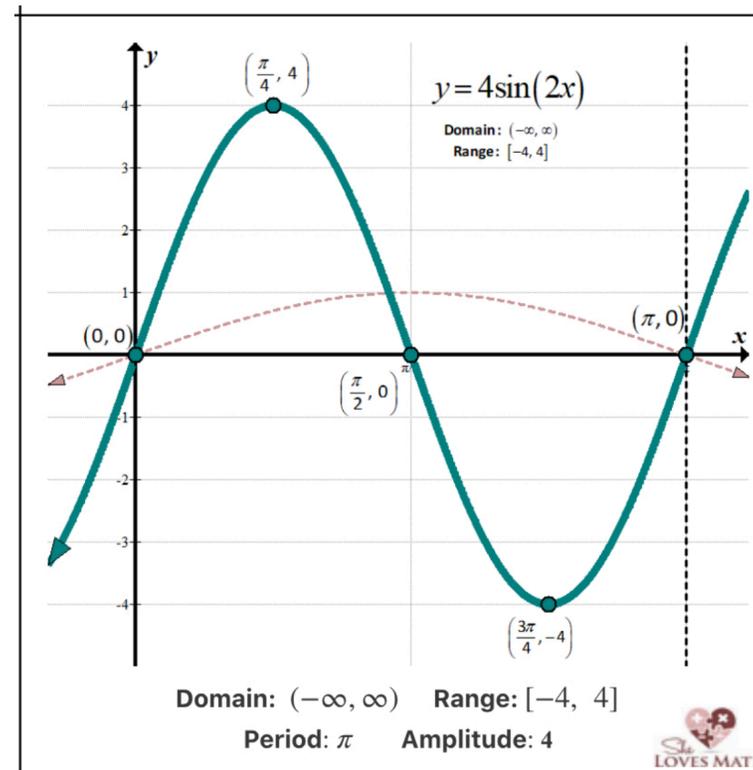
Vertical Shift of Trigonometric Functions

Adding a value D to a trig function will translate its graph vertically. If D is positive, the graph will shift up by a factor of D ; if D is negative, the graph will shift down. Normally $d = 0$.

Vocabulary: Amplitude - amplituda
 Period - perioda
 Phase shift - fazovy posun
 Vertical shift - vertikálny posun
 Adjusting - prispobenie
 Displacement - posunutie
 Stretch - roztiahnutie
 Compression - stlačenie
 Value - hodnota
 Divided - deleny
 Adding - pridavanie
 Domain - def. obor
 Range - obor hodnot



For better imagination click [here](#).

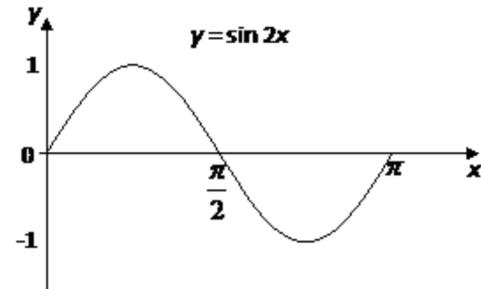


Excercises:

1. Find the period of the graph $y = \sin 2x$ and sketch the graph of $y = \sin 2x$ for $0 \leq 2x \leq \pi$.

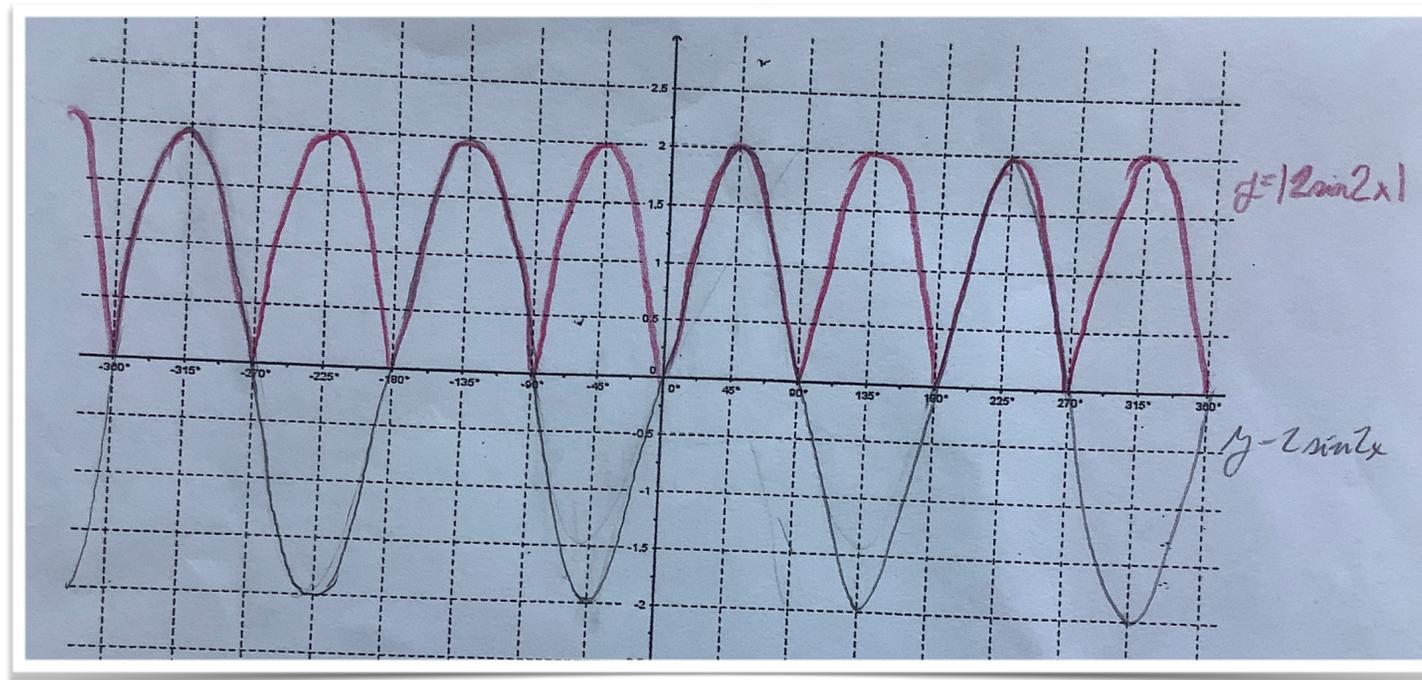
Solution:

Since $B = 2$, the period is $P = 2\pi/B = 2\pi/2 = \pi$



2. Sketch the graph $y = |2\sin 2x|$ and write their amplitude, period, domain, range, minimum, maximum.

Solution:



Domain= \mathbb{R}
 Range= $\langle 0, 2 \rangle$
 Minimum = $0^\circ + k \cdot 90^\circ$
 Maximum = $2 + k \cdot 90^\circ$
 Period = 90°
 Amplitude = 2

Summary of Sine Function

Periodic Functions Definition, Period, Phase Shift, Amplitude, Vertical Shift.

A periodic function is a function whose graph repeats itself identically from left to right.

The period of a function is the horizontal distance required for a complete cycle.

The period of a basic sine and cosine function is 2π .

The frequency of a function is the reciprocal of the period.

The phase shift of a function is the horizontal shift of a periodic function.

The amplitude of a function is half the distance between the maximum and minimum values of a periodic function. The amplitude is always positive.

The vertical shift of a function is the vertical shift of a periodic function along the y-axis.