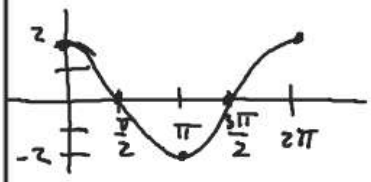
$\frac{2\pi}{1} \div \frac{1}{3}$

$\frac{2\pi}{1} \cdot \frac{3}{1} = 6\pi$

$y = 2\cos x$

Amp = 2

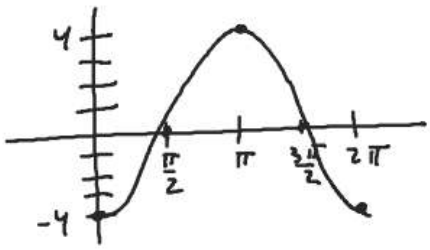


Vertical Stretch by factor of 2

$y = -4\cos x$

Amp = 4

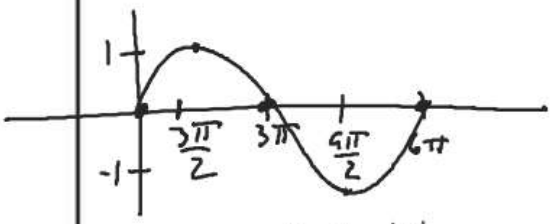
Reflect over x-axis



$y = \sin \frac{x}{3}$

$B = \frac{1}{3}$

Per $\frac{2\pi}{B} = \frac{2\pi}{\frac{1}{3}} = 6\pi$

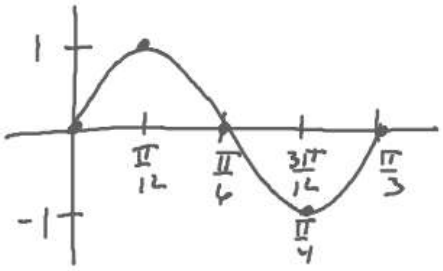


Horizontal Stretch by factor of 3

$y = \sin 6x$

$B = 6$

Per $\frac{2\pi}{B} = \frac{2\pi}{6} = \frac{\pi}{3}$



What you'll Learn About

- The basic waves revisited/Sinusoids and Transformations
- Modeling

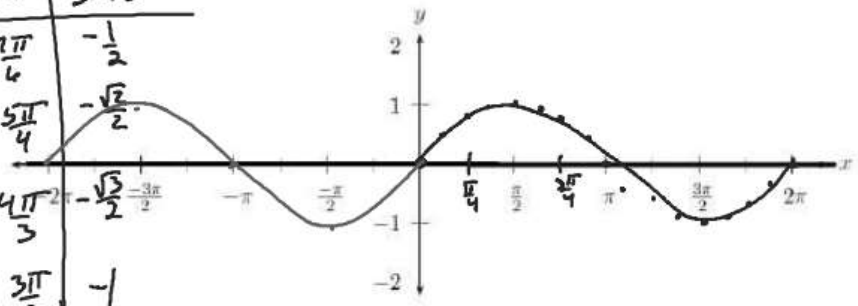
$y = A \sin B(x-c) + D$

$y = A \cos B(x-c) + D$

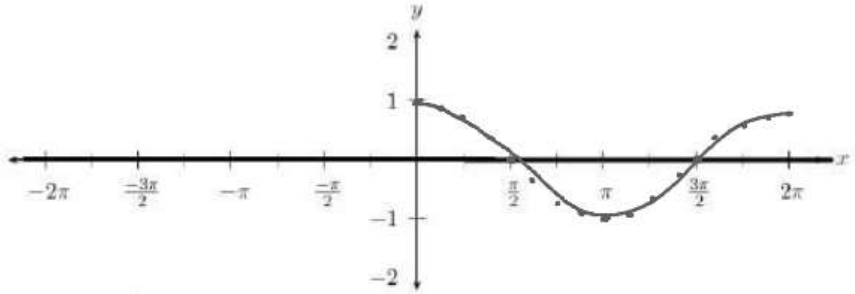
θ	$\sin\theta$
0	0
$\frac{\pi}{6}$	$\frac{1}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} \approx .707$
$\frac{\pi}{3}$	$\frac{\sqrt{3}}{2} \approx .8660$
$\frac{\pi}{2}$	1
$\frac{2\pi}{3}$	$\frac{\sqrt{3}}{2}$
$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2}$
$\frac{5\pi}{6}$	$\frac{1}{2}$
π	0

The graph of y = sin x

θ	$\sin\theta$
$\frac{7\pi}{6}$	$-\frac{1}{2}$
$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{4\pi}{3}$	$-\frac{\sqrt{3}}{2}$
$\frac{3\pi}{2}$	-1
$\frac{5\pi}{3}$	$-\frac{\sqrt{3}}{2}$
$\frac{7\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{11\pi}{6}$	$-\frac{1}{2}$
2π	0



The graph of y = cos x



θ	$\cos\theta$
0	1
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2}$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2}$
$\frac{\pi}{3}$	$\frac{1}{2}$
$\frac{\pi}{2}$	0
$\frac{2\pi}{3}$	$-\frac{1}{2}$
$\frac{3\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{5\pi}{6}$	$-\frac{\sqrt{3}}{2}$
π	-1

θ	$\cos\theta$
$\frac{7\pi}{6}$	$-\frac{\sqrt{3}}{2}$
$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{4\pi}{3}$	$-\frac{1}{2}$
$\frac{3\pi}{2}$	0

θ	$\cos\theta$
$\frac{5\pi}{3}$	$\frac{1}{2}$
$\frac{7\pi}{4}$	$\frac{\sqrt{2}}{2}$
$\frac{11\pi}{6}$	$\frac{\sqrt{3}}{2}$
2π	1

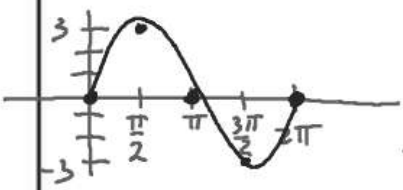
$y = A\sin x$

$y = A\cos x$

$|A| \rightarrow$ Amplitude

Find the amplitude of the function and use the language of transformations to describe how the graph of the function is related to the graph of $y = \sin x$

A) $y = 3\sin x$

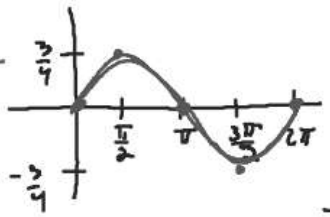


Vertical Stretch by factor of 3

Amplitude = 3

B) $y = \frac{3}{4}\sin x$

Amp = $\frac{3}{4}$

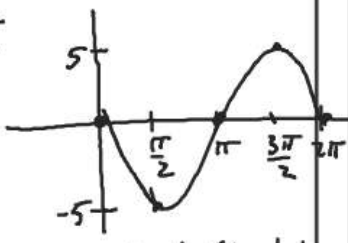


Vertical Compression by a factor of 3/4

C) $y = -5\sin x$

Amp = 5

Reflect over x-axis



Vertical Stretch by Factor of 5

Period - How long it takes to repeat

$y = A\sin Bx$

$y = A\cos Bx$

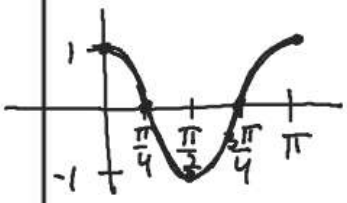
$Per = \frac{2\pi}{B}$

Find the period of the function and use the language of transformations to describe how the graph of the function is related to the graph of $y = \cos x$

A) $y = \cos(2x)$

$B = 2$

$Per = \frac{2\pi}{B} = \frac{2\pi}{2} = \pi$



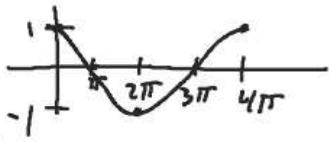
Horizontal Compression by factor of 1/2

B) $y = \cos\frac{x}{2}$

$\cos\frac{1}{2}x$

$B = \frac{1}{2}$

$Per = \frac{2\pi}{B} = \frac{2\pi}{\frac{1}{2}} = 2\pi \cdot \frac{2}{1} = 4\pi$



Horizontal Stretch by Factor of 2

C) $y = \cos\left(\frac{-3x}{4}\right)$

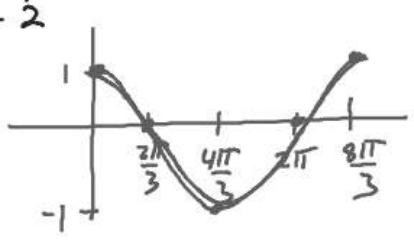
$= \cos\frac{3x}{4}$

$B = \frac{3}{4}$

$Per = \frac{2\pi}{B} = \frac{2\pi}{\frac{3}{4}}$

$\frac{2\pi}{1} \cdot \frac{4}{3}$

$\frac{8\pi}{3}$



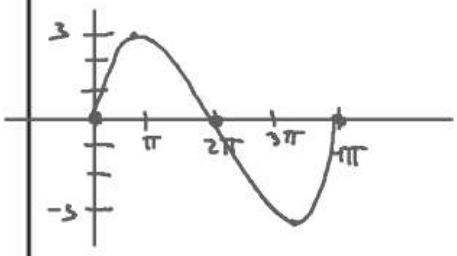
Horizontal Stretch by Factor 4/3

Graph 1 period of the function without using your calculator.

A) $y = 3\sin\frac{x}{2}$

Amp = 3

Per $\frac{2\pi}{B} = \frac{2\pi}{\frac{1}{2}} = 4\pi$

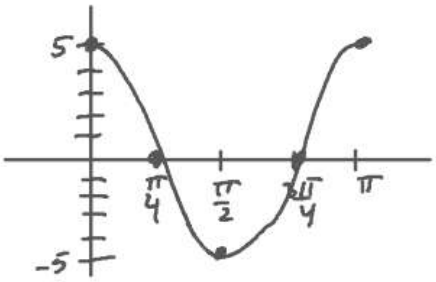


$y = 5\cos 2x$

Amp = 5

B = 2

Per = $\frac{2\pi}{B} = \frac{2\pi}{2} = \pi$



Identify the maximum and minimum values and the zeros of the function in the interval $[-2\pi, 2\pi]$. Use your understanding of transformations, not your calculator.

A) $y = 4\sin x$

B) $y = -2\cos\frac{x}{3}$