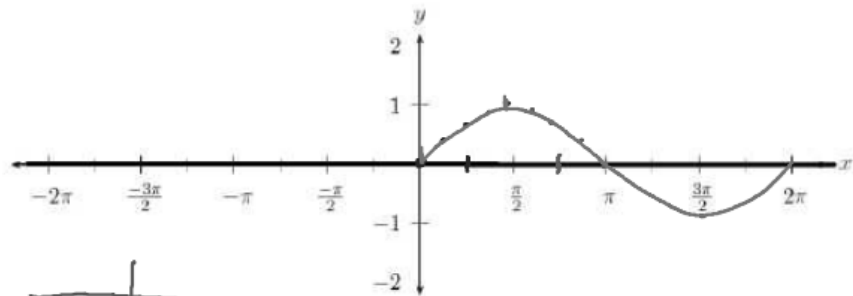


What you'll Learn About

- The basic waves revisited/Sinusoids and Transformations
- Modeling

x	$\sin x$
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
$\frac{2\pi}{3}$	$\frac{\sqrt{3}}{2} \approx .866$
$\frac{3\pi}{4}$	$\frac{\sqrt{2}}{2} \approx .707$
$\frac{5\pi}{6}$	$\frac{1}{2}$
π	0

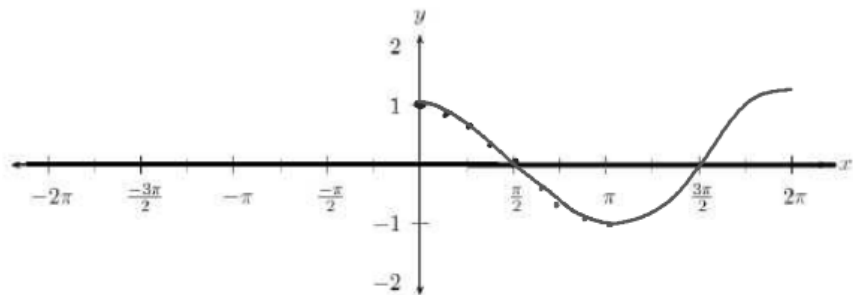
The graph of $y = \sin x$



$\frac{7\pi}{6}$	$-\frac{1}{2}$
$\frac{5\pi}{4}$	$-\frac{\sqrt{2}}{2}$
$\frac{4\pi}{3}$	$-\frac{\sqrt{3}}{2}$
$\frac{3\pi}{2}$	-1

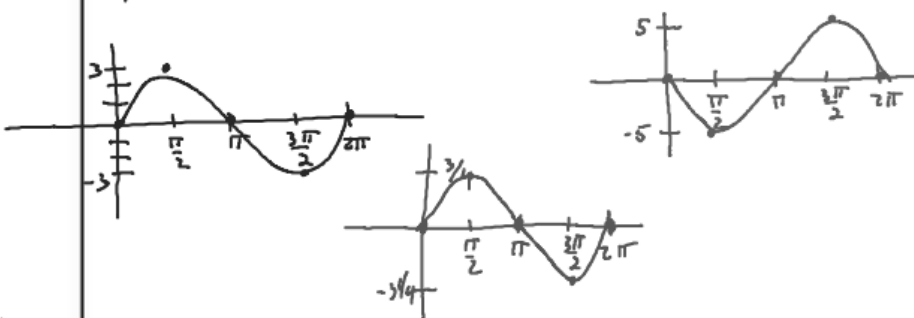
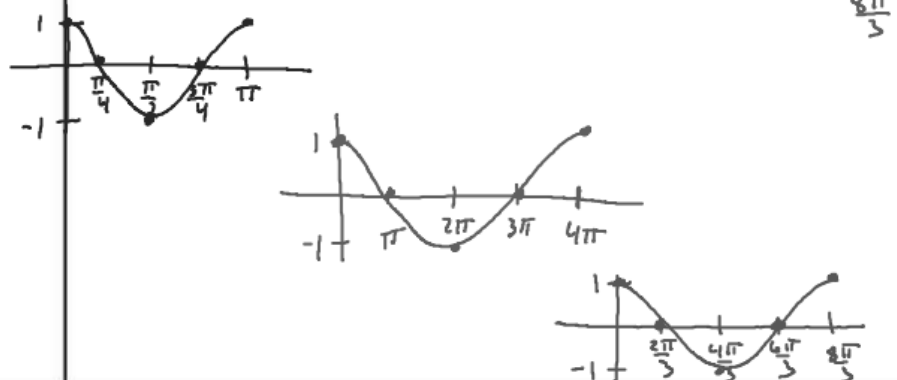
The graph of $y = \cos x$

x	$\cos x$
0	1
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2} \approx .8660$
$\frac{\pi}{4}$	$\frac{\sqrt{2}}{2} \approx .707$
$\frac{\pi}{3}$	$\frac{1}{2}$
$\frac{\pi}{2}$	0
$\frac{2\pi}{3}$	$-\frac{1}{2}$
$\frac{3\pi}{4}$	$-\frac{\sqrt{2}}{2} \approx -.707$



$\frac{5\pi}{6}$	$-\frac{\sqrt{3}}{2} \approx -.8660$
π	-1

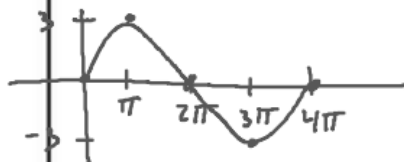
$$y = 3x^2$$

$y = A \sin x$ $y = A \cos x$ <p>$A = \text{Amplitude}$</p> <p>Period - How long Function takes to repeat itself.</p> $y = A \sin Bx$ $y = A \cos Bx$ $\text{Period} = \frac{2\pi}{B}$	<p>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 $y = \sin x$</p> <p>A) $y = 3 \sin x$ $\text{Amp} = 3$ Vert stretch by factor of 3</p> <p>B) $y = \frac{3}{4} \sin x$ $\text{Amp} = \frac{3}{4}$ Vertical Comp by factor of $\frac{3}{4}$</p> <p>C) $y = -5 \sin x$ $\text{Amp} = 5$ Vertical stretch by factor of 5 Reflect over x-axis</p>  <p>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 $y = \cos x$</p> <p>A) $y = \cos(2x)$ $B = 2$ $\text{Per} = \frac{2\pi}{2} = \pi$ Horizontal compression by factor of 2</p> <p>B) $y = \cos \frac{x}{2}$ $B = \frac{1}{2}$ $\text{Per} = \frac{2\pi}{1/2} = 4\pi$ Horizontal stretch by a factor of 2</p> <p>C) $y = \cos \left(\frac{3x}{4} \right)$ $B = \frac{3}{4}$ $\text{Per} = \frac{2\pi}{3/4} = \frac{8\pi}{3}$</p> 
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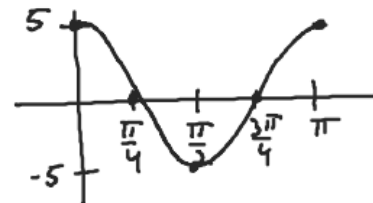
Graph 1 period of the function without using your calculator.

$$\begin{aligned} \text{Amp} &= 3 \\ \text{Per} &= \frac{2\pi}{B} \\ &= \frac{2\pi}{\frac{1}{2}} = 4\pi \end{aligned}$$

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



$$\begin{aligned} y &= 5\cos 2x & \text{Amp} &= 5 \\ \text{Per} &= \frac{2\pi}{B} & & \\ &= \frac{2\pi}{2} = \pi & & \end{aligned}$$



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

$$y = x^2 \quad y = (x-5)^2$$

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

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

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

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

$$\text{Amp} = 1$$

$$\text{Per} = 2\pi$$

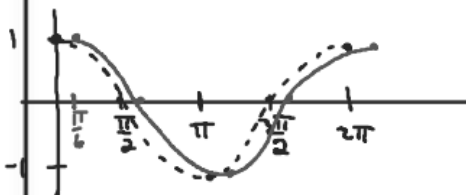
$$\text{P.S. } \frac{\pi}{6} \text{ Left}$$

$$\text{V.S. Down } 1$$

Determine the phase shift for the function and the sketch the graph.

A) $y = \cos\left(x - \frac{\pi}{6}\right)$ $\text{Amp} = 1$
 $\text{Per} = 2\pi$

P.S. $\frac{\pi}{6}$ Right

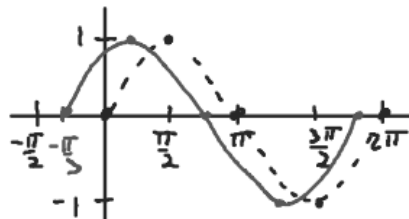


B) $y = \sin\left(x + \frac{\pi}{3}\right)$

$$\text{Amp} = 1$$

$$\text{Per} = 2\pi$$

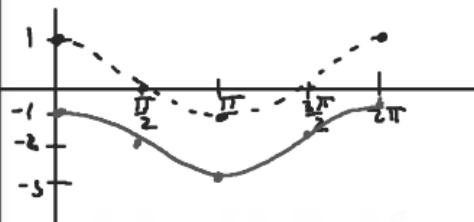
P.S. Left $\frac{\pi}{3}$



Determine the vertical shift for the function and the sketch the graph.

A) $y = \cos x - 2$ $\text{Amp} = 1$
 $\text{Per} = 2\pi$

V.S. Down 2

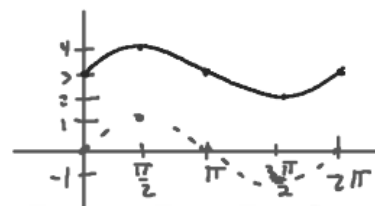


B) $y = \sin x + 3$

$$\text{Amp} = 1$$

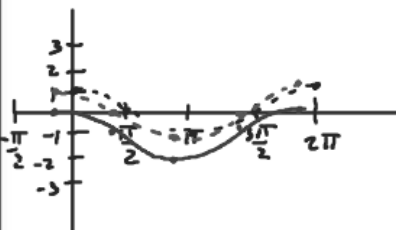
$$\text{Per} = 2\pi$$

V.S. Up 3



Determine the vertical shift and phase shift of the function and then sketch the graph

A) $y = \cos\left(x + \frac{\pi}{6}\right) - 1$

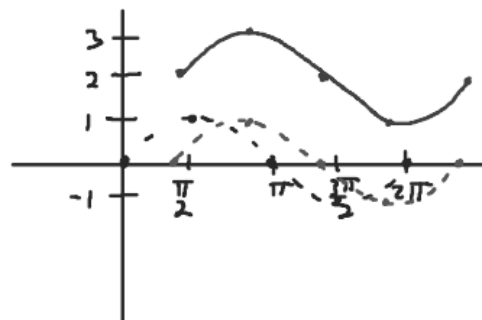


B) $y = \sin\left(x - \frac{\pi}{3}\right) + 2$ $\text{Amp} = 1$

$$\text{Per} = 2\pi$$

P.S. $\frac{\pi}{3}$ Right

V.S. Up 2

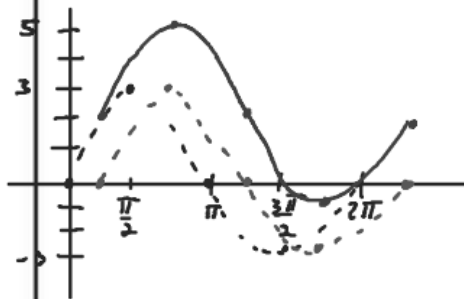


$$y = A \sin B(x-c) + D$$

State the Amplitude and period of the sinusoid, and relative to the basic function, the phase shift and vertical translation.

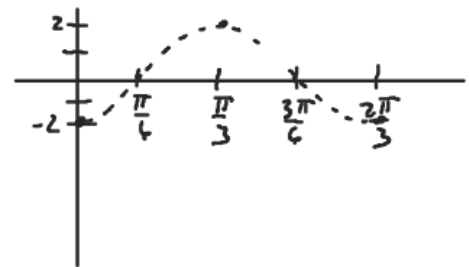
A) $y = 3 \sin\left(x - \frac{\pi}{4}\right) + 2$

Amp = 3
 Per = 2π
 P.S. $\frac{\pi}{4}$ Right
 V.S. up 2



B) $y = -2 \cos\left(3x - \frac{\pi}{4}\right) - 4$
 $= -2 \cos 3\left(x - \frac{\pi}{12}\right) - 4$

Amp = 2
 Per = $\frac{2\pi}{B} = \frac{2\pi}{3}$
 P.S. $\frac{\pi}{12}$ Right
 V.S. Down 4



C) $y = 5 \sin 4\pi x + 6$

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

