

L4 – 5.3 Transformations of Trig Functions

MHF4U

Jensen

Part 1: Transformation Properties

$$y = a \sin[k(x - d)] + c$$

[Desmos Demonstration](#)

a	k	d	c
Vertical stretch or compression by a factor of a . Vertical reflection if $a < 0$ $ a = \text{amplitude}$	Horizontal stretch or compression by a factor of $\frac{1}{k}$. Horizontal reflection if $k < 0$. $\frac{2\pi}{ k } = \text{period}$	Phase shift $d > 0$; <i>shift right</i> $d < 0$; <i>shift left</i>	Vertical shift $c > 0$; <i>shift up</i> $c < 0$; <i>shift down</i>

Example 1: For the function $y = 3 \sin \left[\frac{1}{2} \left(\theta + \frac{\pi}{3} \right) \right] - 1$, state the...

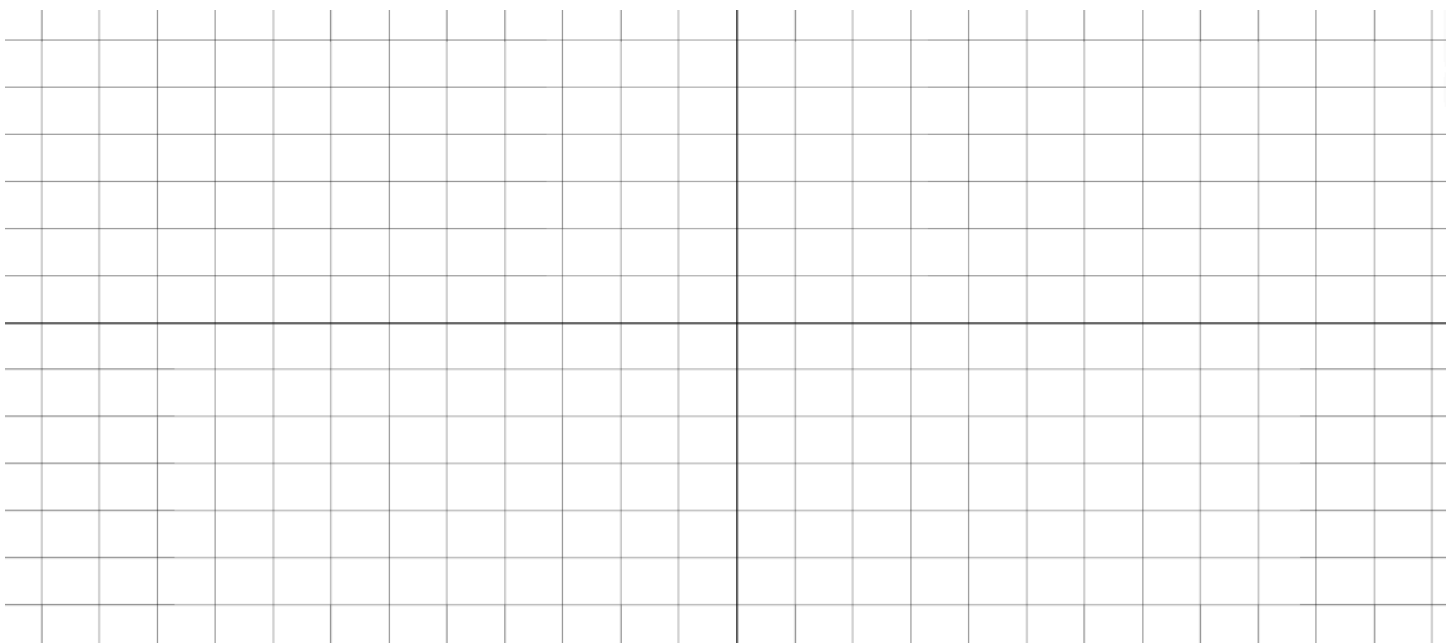
Amplitude:	Period:
Phase shift:	Vertical shift:
Max:	Min:

Part 2: Given Equation → Graph Function

Example 2: Graph $y = 2 \sin \left[2 \left(x - \frac{\pi}{3} \right) \right] + 1$ using transformations. Then state the amplitude and period of the function.

$y = \sin x$	
x	y

$y = 2 \sin \left[2 \left(x - \frac{\pi}{3} \right) \right] + 1$	



Amplitude:

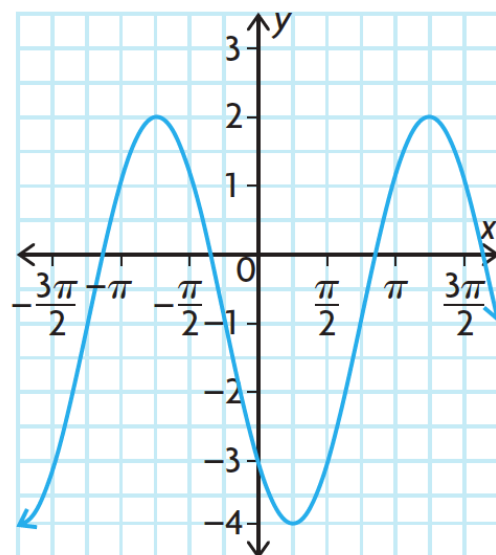
Period:

Part 3: Given the Graph → Write the Equation

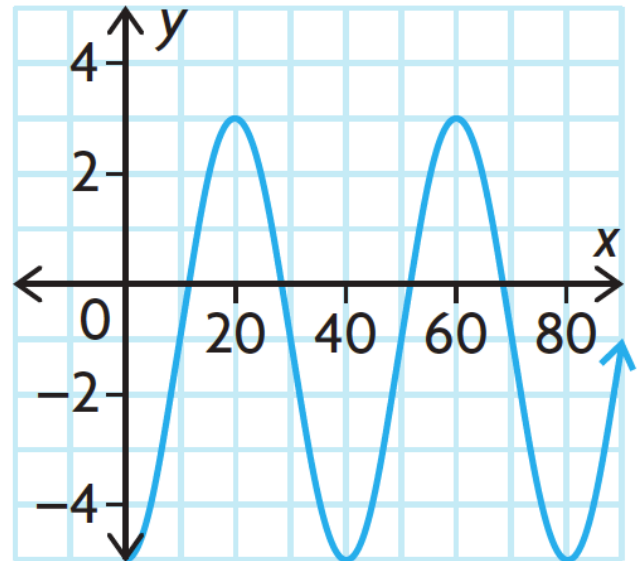
$$y = a \sin[k(x - d)] + c$$

a	k	d	c
Find the amplitude of the function:	Find the period (in radians) of the function using a starting point and ending point of a full cycle.	<p>for sin x: trace along the center line and find the distance between the y-axis and the bottom left of the closest rising midline.</p> <p>for cos x: the distance between the y-axis and the closest maximum point</p>	<p>Find the vertical shift</p> <p>OR</p> <p>(this finds the 'middle' of the function)</p>

Example 3: Determine the equation of a sine and cosine function that describes the following graph



Example 4: Determine the equation of a sine and cosine function that describes the following graph

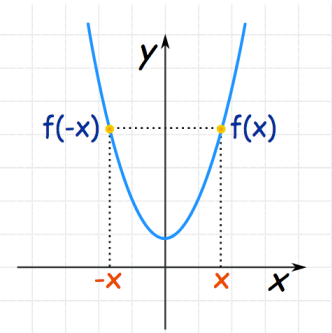
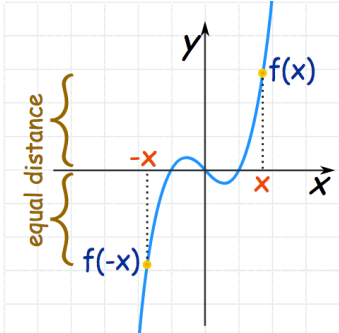
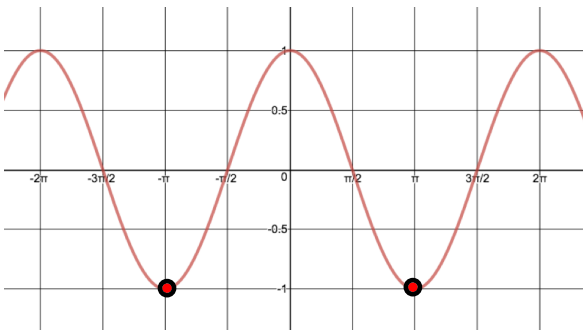
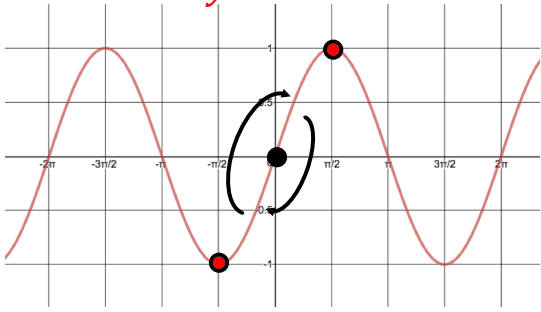


Example 5:

a) Create a sine function with an amplitude of 7, a period of π , a phase shift of $\frac{\pi}{4}$ right, and a vertical displacement of -3.

b) What would be the equation of a cosine function that represents the same graph as the sine function above?

Part 4: Even and Odd Functions

Even Functions	Odd Functions
<p>EVEN FUNCTION if:</p> <p>Line symmetry over the _____</p>	<p>ODD FUNCTION if:</p> <p>Point symmetry about the _____</p>
<p>Rule:</p> $f(-x) = f(x)$ 	<p>Rule:</p> $-f(x) = f(-x)$ 
<p>Example:</p> $y = \cos x$ 	<p>Example:</p> $y = \sin x$  <p>$y = \tan x$ is also an odd function</p> 