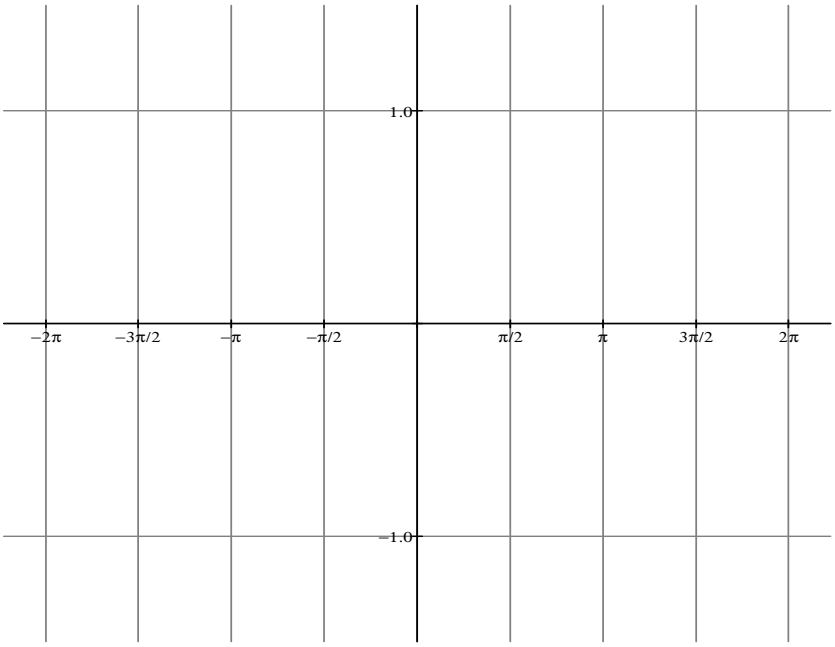
Section 5.1 **Graphs of Sine, Cosine, and Tangent Functions**

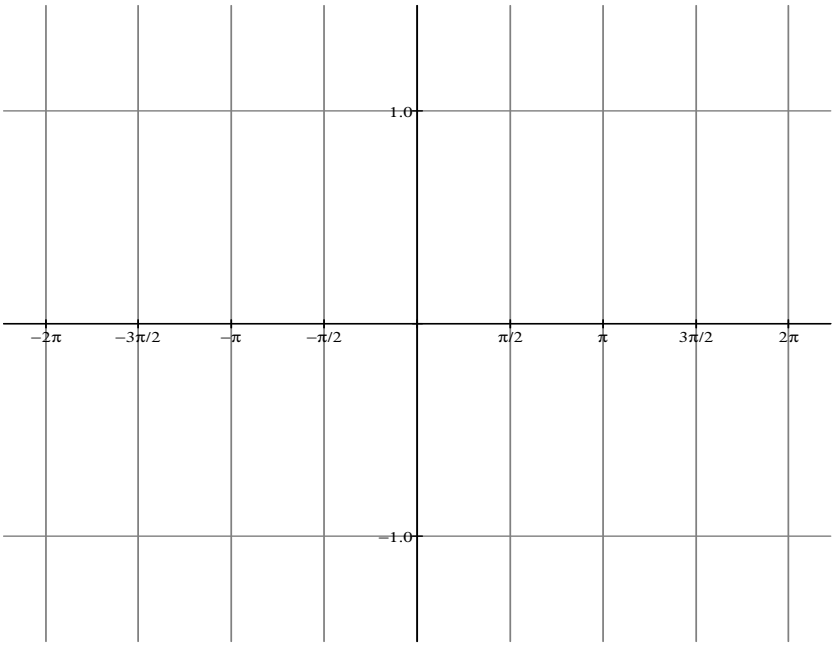
Graph of $y = sin\theta \; for \; -2\pi \leq \theta \leq 2\pi$

θ	θ	y
-360°	-2π	
-270°	-3π/2	
-180°	-π	
-90°	-π/2	
0°	0	
90°	π/2	
180°	π	
270°	3π/2	
360°	2π	



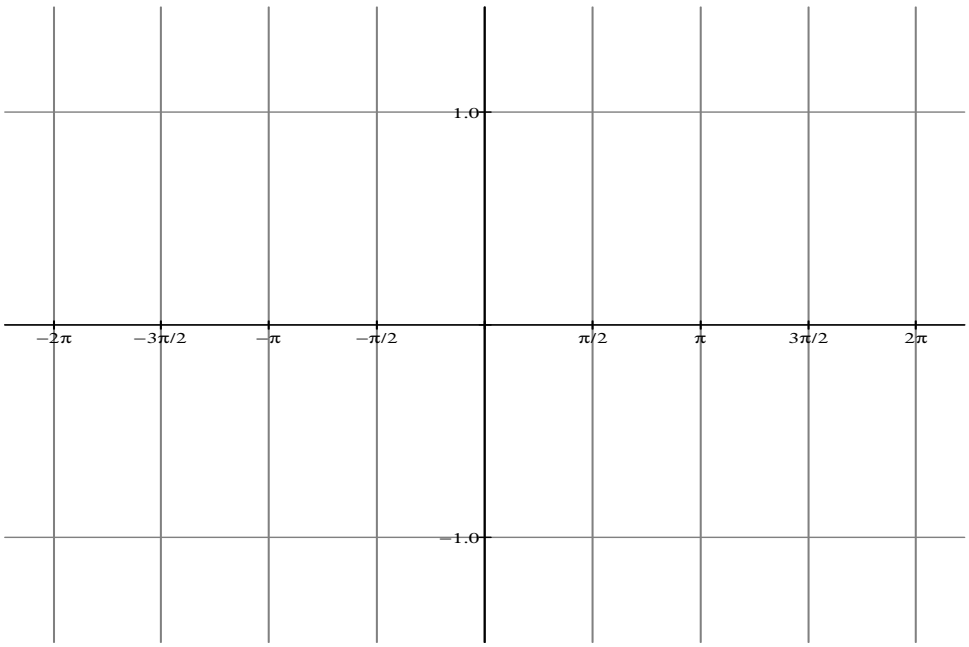
Graph of $y = \cos\theta$ for $-2\pi \leq \theta \leq 2\pi$.

θ	y



Graph of $y = \tan\theta$ for $-2\pi \leq x \leq 2\pi$.

θ	y



Basic Transformations of $y = \sin\theta$ and $y = \cos\theta$ still hold true for angles measured in radians.

Amplitude $\Rightarrow y = a\sin\theta \ and \ y = a\cos\theta$

- "a" is the amplitude of the function.
- When "a" is negative, a reflection exists over the x-axis.
- a = (maximum- minimum) / 2

Vertical Displacement $\Rightarrow y = \sin\theta + c \ and \ y = \cos\theta + c$

- The function moves up or down along the y-axis by "c" units.
- c = (maximum + minimum) / 2

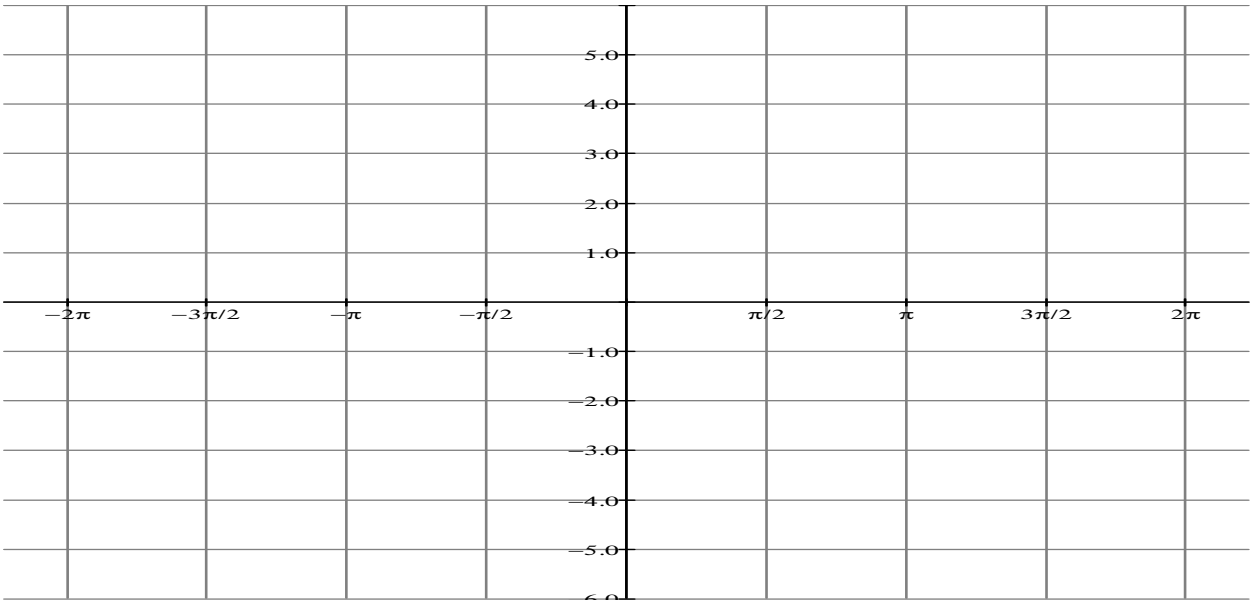
Phase Shift $\Rightarrow y = \sin(\theta - d) \ and \ y = \cos(\theta - d)$

- The function moves left or right along the θ-axis by "d" units.

Period Change $\Rightarrow y = \sin k\theta \ and \ y = \cos k\theta$

- The function has a new period given by p = 2π / k.
- So k = 2π / p

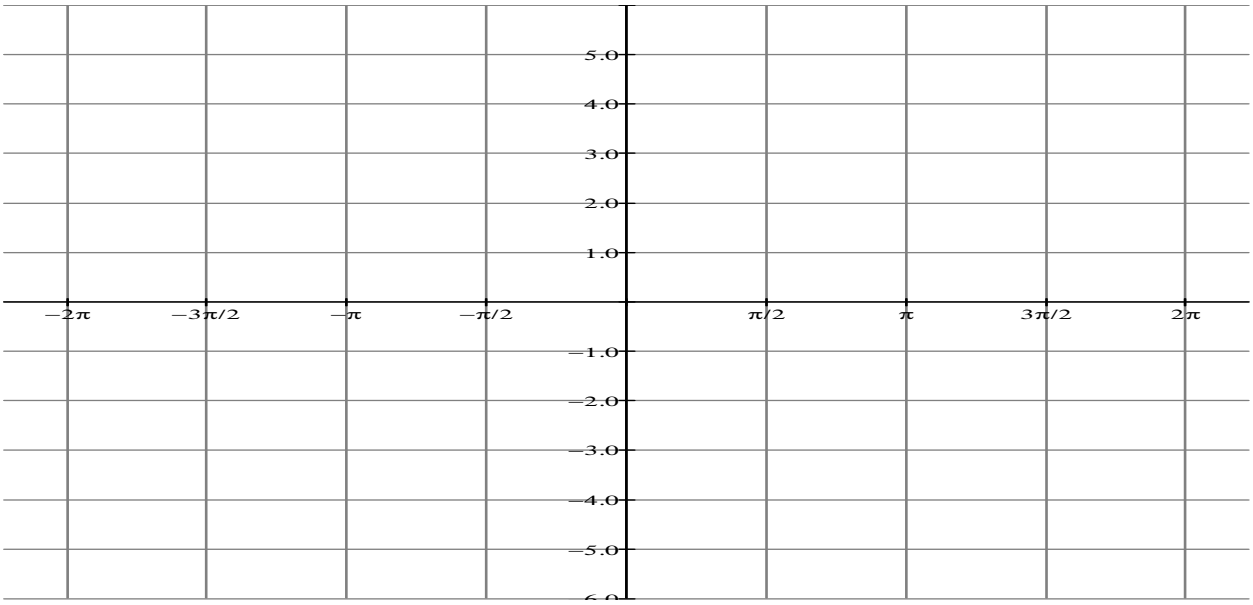
Example: Transform the graph of $y = \sin x$ to obtain $y = \sin x - 2$, over two cycles.



Amplitude: Period: Phase Shift:

Domain: Range: Vert.Displacement:

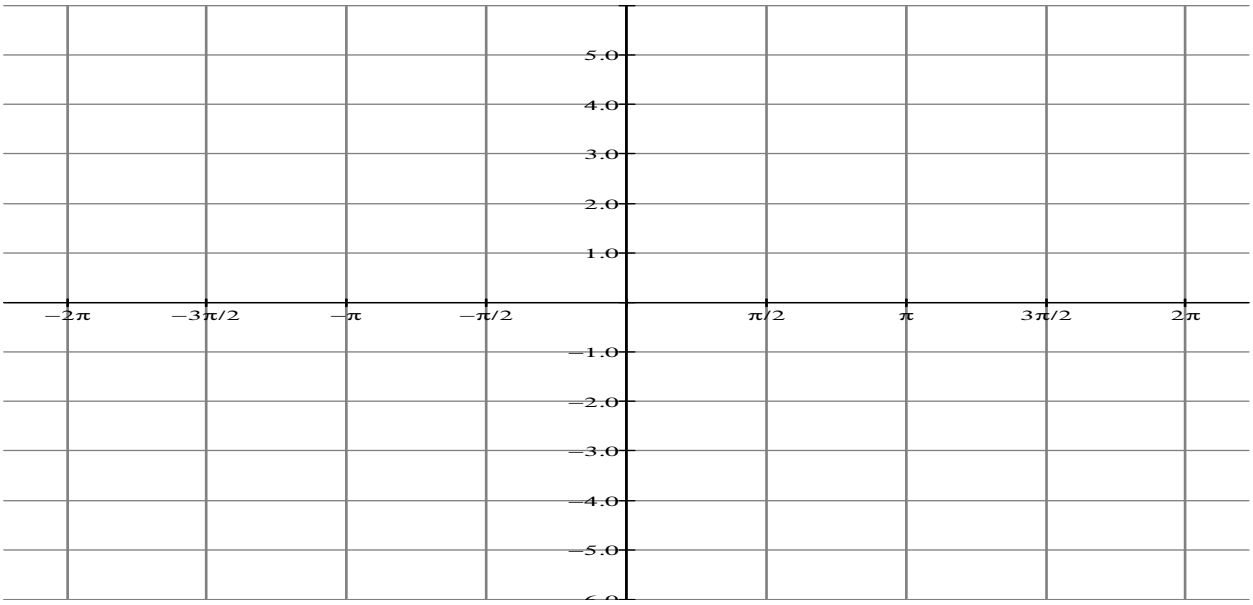
Example: Transform the graph of $y = \cos x$ to obtain $y = -3\cos x$, over two cycles.



Amplitude: Period: Phase Shift:

Domain: Range: Vert.Displacement:

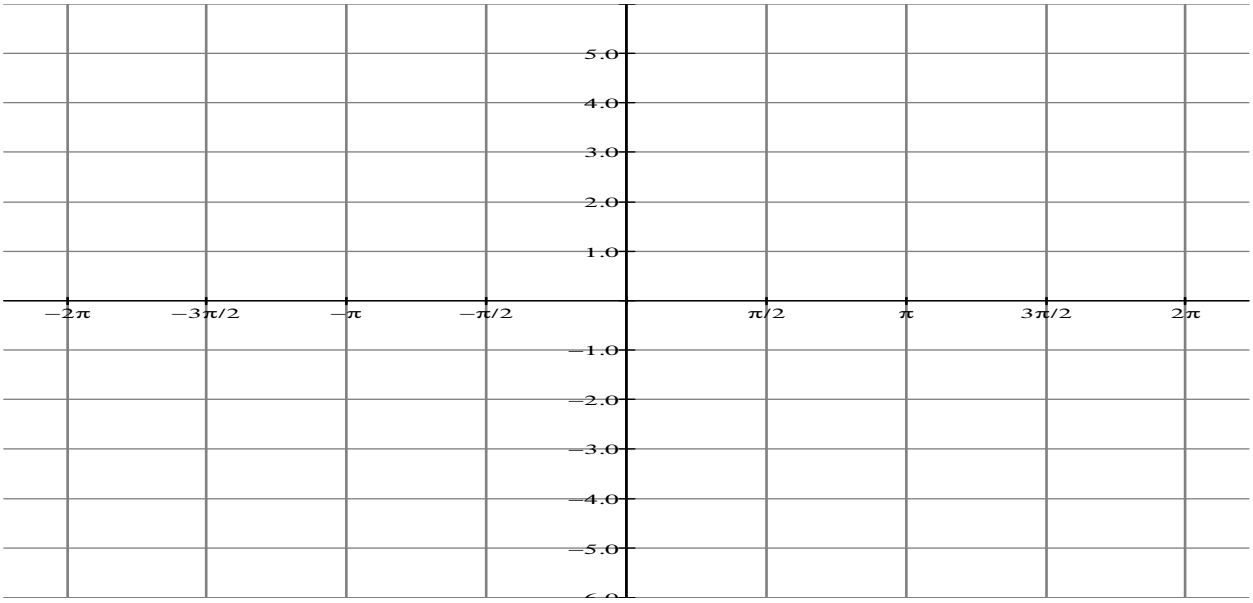
Example: Transform the graph of $y = \sin x$ to obtain $y = \sin\left(x - \frac{\pi}{3}\right)$, over two cycles.



Amplitude: Period: Phase Shift:

Domain: Range: Vert.Displacement:

Example: Transform the graph of $y = \cos x$ to obtain $y = \cos 2x$, over two cycles.



Amplitude: Period: Phase Shift:

Domain: Range: Vert.Displacement:

Example: A cosine function has a period of 6π, a maximum value of 5, and a minimum value of -9. Assuming there is no phase shift, determine an equation representing this cosine function in the form $y = a\cos(kx) + c$.

Example: One cycle of a sine function begins at x = -π/4 and ends at x = 5π/4.

a) Determine the period of the function.

b) Determine the phase shift of the function.

c) Write the equation of the function in the form $y = sin[k(x - d)]$