10.2: Graphing Cosine

What does the graph of sine represent?

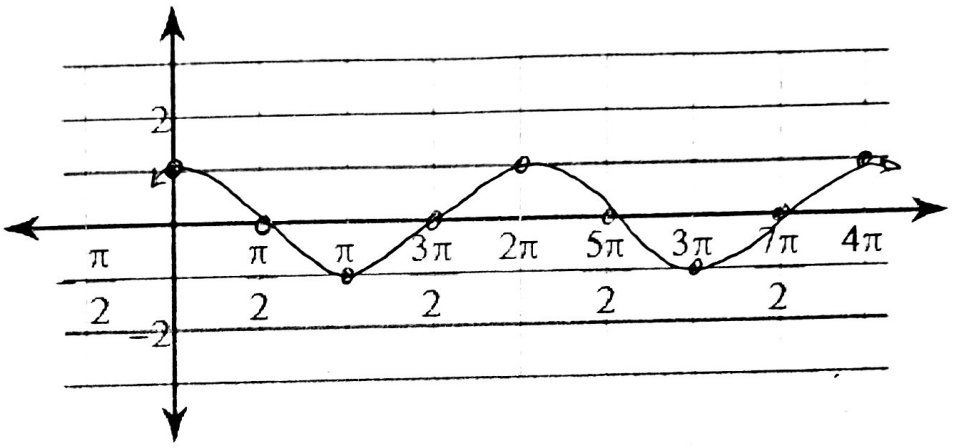
y-values of the unit circle

What do you think the graph of cosine represents?

x-values of the unit circle

Similar to last lesson, you will fill out the table for the values of $y = \cos\theta$.

θ	y
0	1
$\frac{\pi}{2}$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1
$\frac{5\pi}{2}$	0
3π	-1
$\frac{7\pi}{2}$	0
4π	1



What are the similarities between the graph of sine and the graph of cosine?

Same shape, both cycles end at 2π

All between -1 & 1

What are the differences?

Cosine starts at the max

What is a pattern you could use to graph cosine?

Max - 0 - Min - 0 - Max

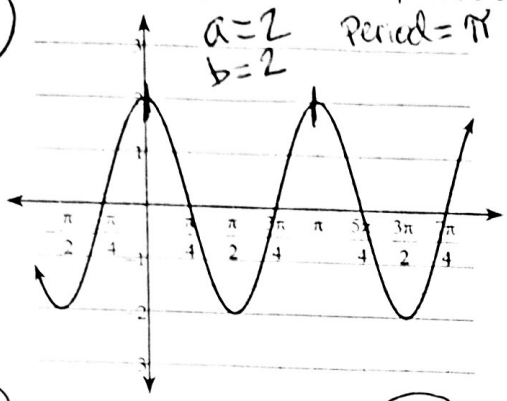
What is the domain and range of $y = \cos\theta$?

D: $(-\infty, \infty)$ R: $[-1, 1]$ (radius)

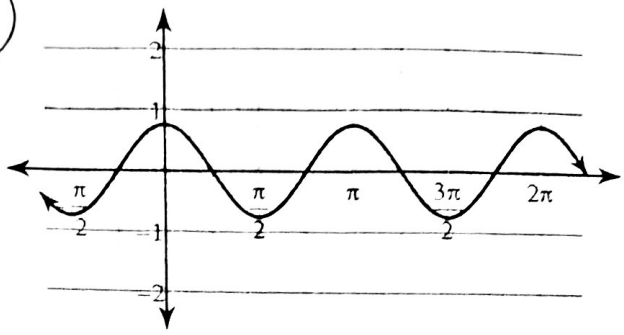
$$y = a\cos b\theta$$

Term	Definition
Period $\left(\frac{2\pi}{b}\right)$	How long it takes to complete one cycle
Frequency (b)	How many cycles are between 0 & 2π
Amplitude (a)	Distance from midline to max/min

1) Find the frequency, period, and amplitude of each cosine function.

a) 

$a=2$ Period $=\pi$
$b=2$

b) 

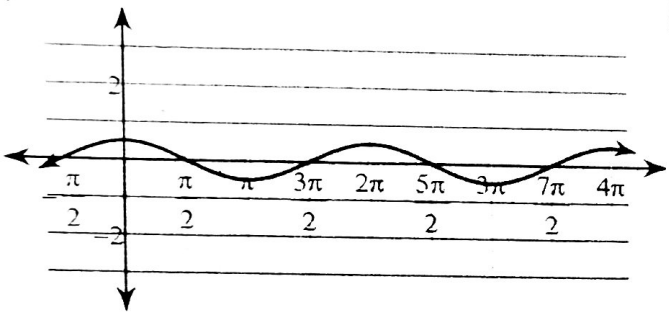
c) $3\cos 4\theta$

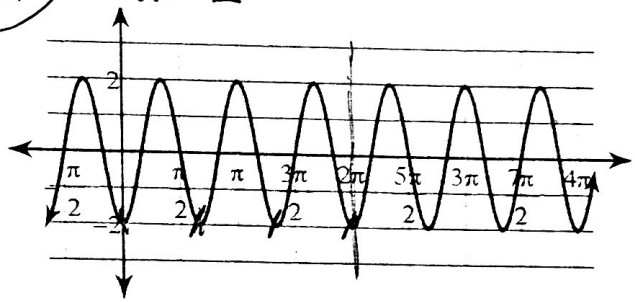
$a=3$ Period $=\frac{2\pi}{4}=\boxed{\frac{\pi}{2}}$

$b=4$

d) $2\cos 2\theta$

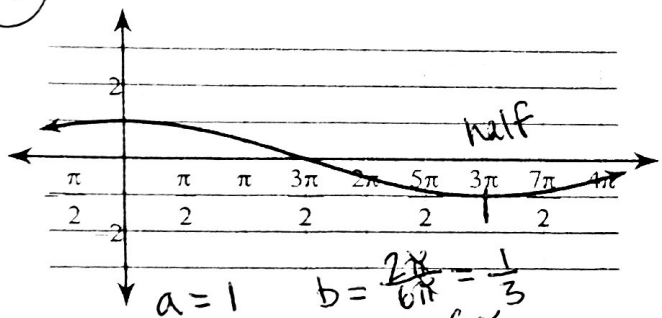
2) Write the equation of each cosine curve.

a) 

b) 

$a=-2$ $b=3$

$y=-2\cos 3\theta$

c) 

half

$a=1$ $b=\frac{2\pi}{6\pi}=\frac{1}{3}$

Period $=6\pi$

$y=\cos\frac{1}{3}\theta$ or $y=\cos\frac{\theta}{3}$

d) Amplitude: π; Period: 2. Assume $a>0$.

$b=\frac{2\pi}{2}=\pi$

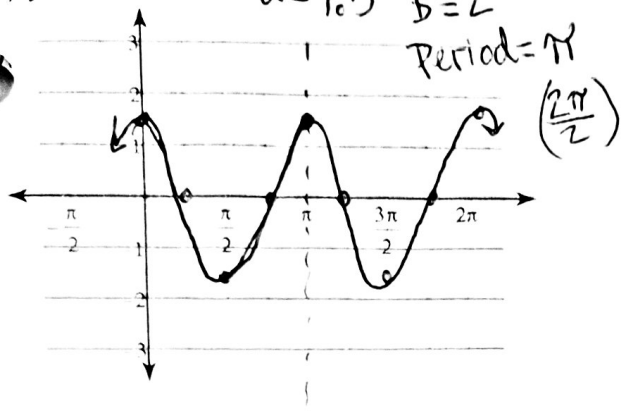
$y=\pi\cos\pi\theta$

e) Amplitude: 1.4; Period: $\frac{\pi}{4}$

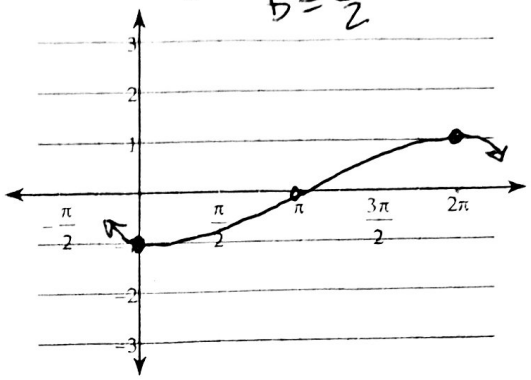
Max-0-Min-0-Max

3) Sketch one cycle for each sine curve. Then write an equation for the function.

a) $y = 1.5\cos 2\theta$ $a=1.5$ $b=2$ Period$=\pi$ $\left(\frac{2\pi}{2}\right)$

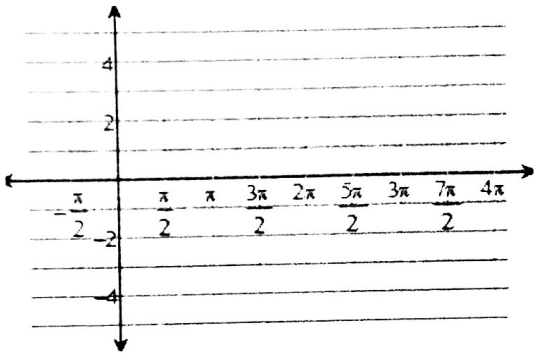


b) $y = -\cos\frac{\theta}{2}$ $a=-1$ $b=\frac{1}{2}$ Period$=4\pi$

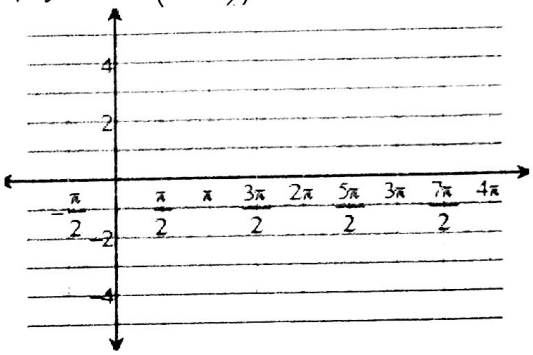


4) Graph the following cosine functions.

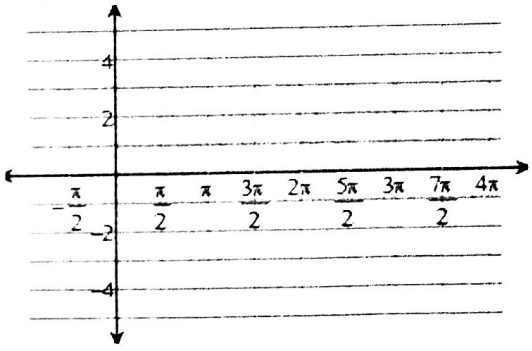
a) $y = \cos x - 1$



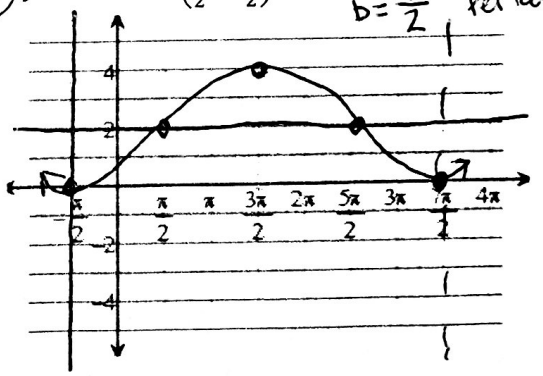
b) $y = \cos\left(x - \frac{\pi}{2}\right)$



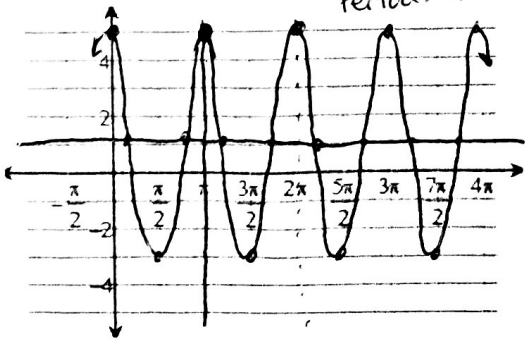
c) $y = 2\cos x - 2$



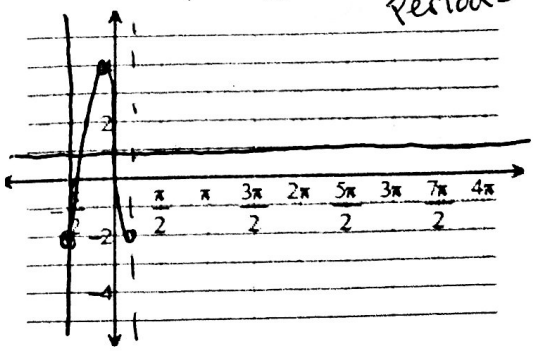
d) $y = -2\cos\left(\frac{x}{2} + \frac{\pi}{2}\right) + 2$ $a=-2$ $b=\frac{1}{2}$ Period$=4\pi$



e) $y = 4\cos(2x - \pi) + 1$ $b=2$ Period$=\pi$

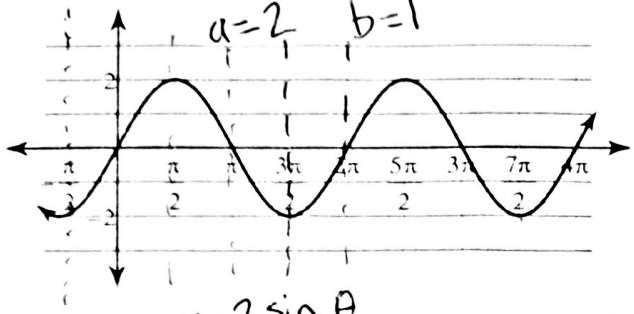


f) $y = -\cos\left(3x + \frac{\pi}{2}\right) + 1$ $b=3$ Period$=\frac{2\pi}{3}$



5) Write three possible equations that could fit with each function. Make sure at least one of them is sine and one of them is cosine.

a)



$y = 2\sin\theta$

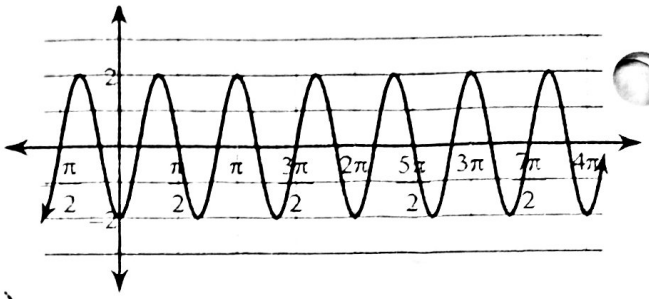
$y = -2\cos(\theta + \frac{\pi}{2})$

$y = -2\cos(\theta - \frac{3\pi}{2})$

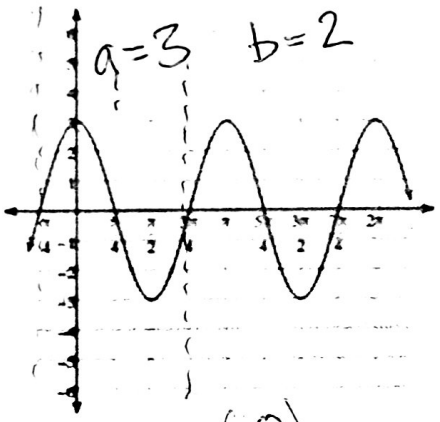
$y = 2\cos(\theta - \frac{\pi}{2})$

$y = -2\sin(\theta - \pi)$

b)



c)

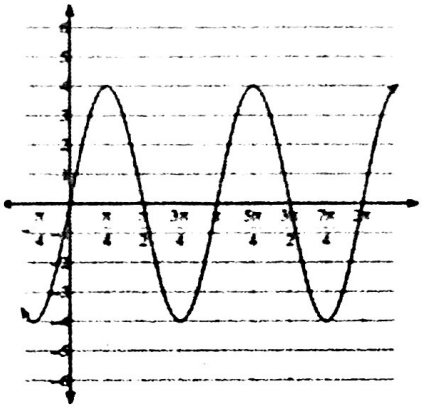


$y = 3\cos(2\theta)$

$y = 3\sin(2\theta + \frac{\pi}{4})$

$y = 3\sin(2\theta - \frac{3\pi}{4})$

d)



Tips to help me

Amplitude, frequency, & period always stay the same

Choose a starting coordinate & write the equation from there

Why are there an infinite amount of equations that could describe a sinusoidal function?