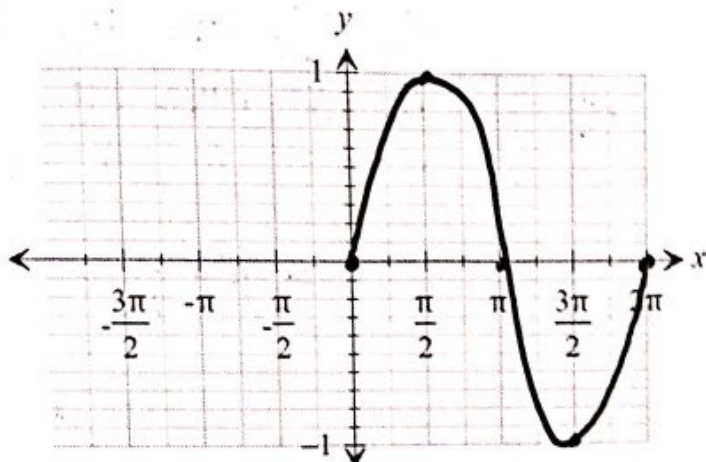


# 10.2N – Graphing Sine and Cosine

## A. Graph Sine and Cosine

Parent sine graph  $f(\theta) = \sin \theta$

Draw the graph and make a table.

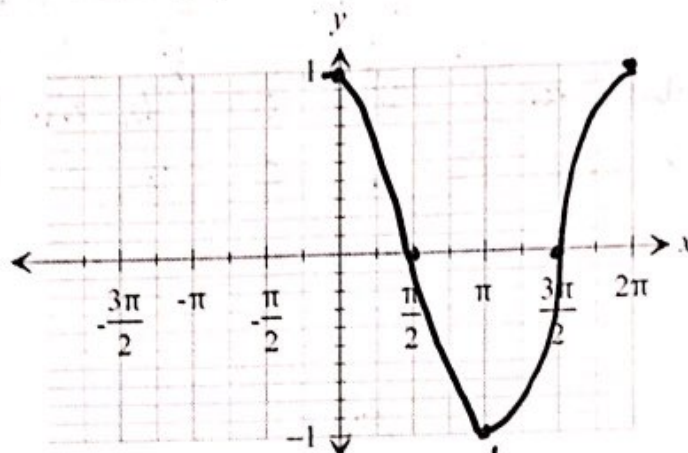


Parent Graph

$\theta$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \sin \theta$	0	1	0	-1	0

Parent cosine graph  $f(\theta) = \cos \theta$

Draw the graph and make a table.



Parent Graph

$\theta$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \cos \theta$	1	0	-1	0	1

## B. Transformations

1. From the 4 transformations in 9.1, today we are discussing

horizontal dilation  $(B)$  and horizontal shift  $(C)$

2. What is the general equation for a trigonometric function?

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

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

Phase shift and Period:

\* opposite inside parentheses  
\* opposite of B & C

Phase Shift =  $C$  horizontal shift

- Moves graph left or right
- opposite of  $C$

Period =

$B$

Formula to find the period =  $\frac{2\pi}{B}$

- how long it takes to complete one cycle

3. Which variable in the equation is related to a horizontal shift?  $C$

- In the parent graph this is:  $0$

4. Which variable in the equation is related to a horizontal stretch?  $B$

- In the parent graph this is:  $1$
- This is used to find the period. The formula for period is:  $\frac{2\pi}{B}$
- The period in the parent graph is  $2\pi$

5. Frequency is defined as the number of oscillations or rotations per unit of time.

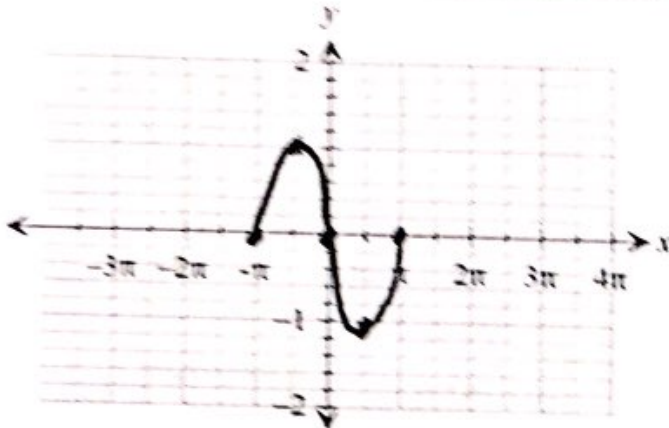
- Frequency is the reciprocal of the period. The formula for frequency is  $\frac{B}{2\pi}$
- The frequency in the parent graph is  $\frac{1}{2\pi}$

D. Making the Graph (Phase Shift and Period)

EX. 1)  $f(\theta) = \sin(\theta + \pi)$

Phase Shift  $-\pi$  b  $1$  Period  $2\pi$  Freq.  $1/2\pi$

	$-\pi$	$-\pi/2$	$0$	$\pi/2$	$\pi$
$x$ value	$-\pi$	$0$	$\pi/2$	$\pi$	$3\pi/2$
Value $y = \sin \theta$	$0$	$1$	$0$	$-1$	$0$

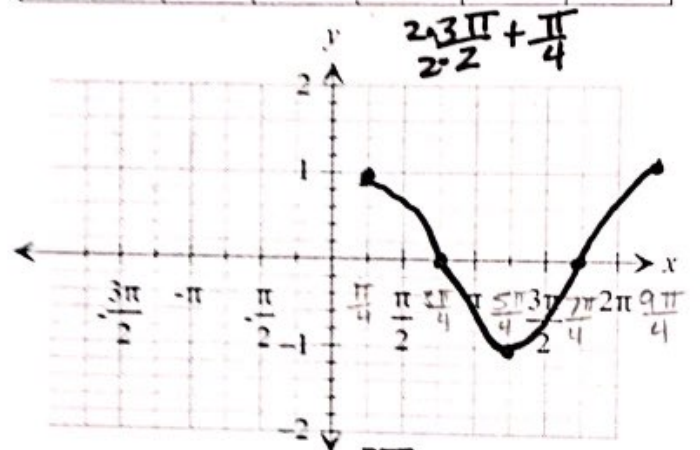


$\frac{\pi}{4} + \frac{\pi \cdot 2}{2 \cdot 2}$   $4 \cdot \frac{\pi}{4} + \frac{\pi}{4}$

EX. 2)  $f(\theta) = \cos(\theta - \frac{\pi}{4})$

Phase Shift  $\pi/4$  b  $1$  Period  $2\pi$  Freq.  $1/2\pi$

	$\pi/4$	$3\pi/4$	$5\pi/4$	$7\pi/4$	$9\pi/4$
$\theta + \frac{\pi}{4}$	$0$	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \cos \theta$	$1$	$0$	$-1$	$0$	$1$

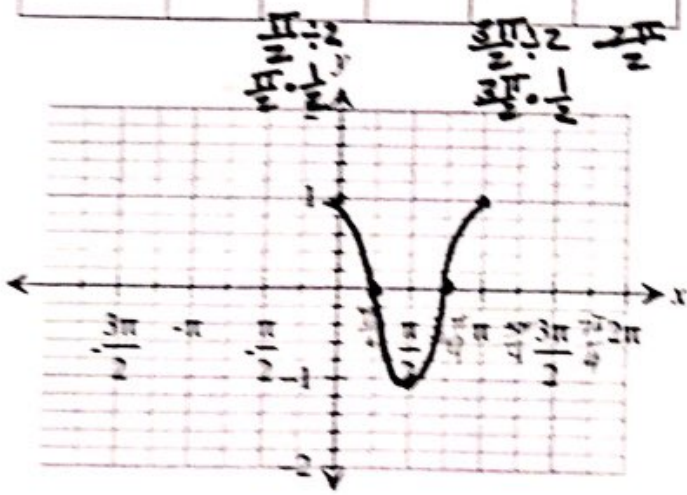


EX. 3)  $f(\theta) = \cos(\theta + 2)$

Phase Shift  $0$  b  $2$  Period  $\frac{2\pi}{2} = \pi$  Freq.  $1/\pi$

Divide by 2

	$0$	$\pi/4$	$\pi/2$	$3\pi/4$	$\pi$
$\frac{\theta}{2}$	$0$	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \cos \theta$	$1$	$0$	$-1$	$0$	$1$

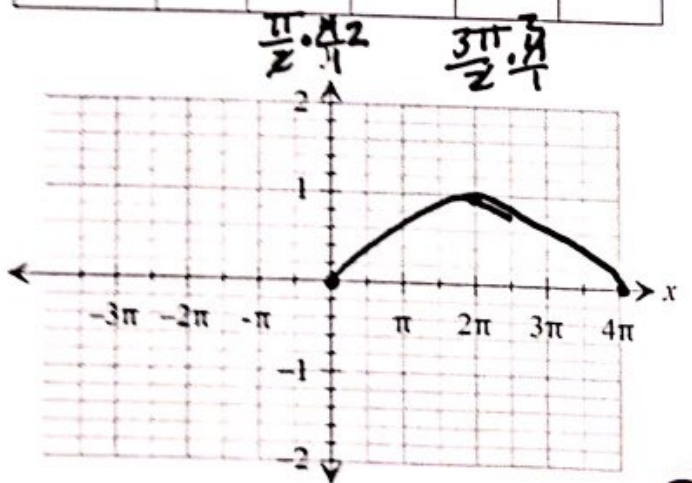


EX. 4)  $f(\theta) = \sin(\theta + 4)$

Phase Shift  $0$  b  $4$  Period  $\frac{2\pi \cdot 4}{4} = 8\pi$  Freq.  $1/8\pi$

Mult by 4

	$0$	$2\pi$	$4\pi$	$6\pi$	$8\pi$
$\theta \cdot 4$	$0$	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \sin \theta$	$0$	$1$	$0$	$-1$	$0$



EX. 5)  $f(\theta) = \sin 2(\theta - \pi)$   
 Phase Shift  $\uparrow \pi$  b 2 Period  $\frac{2\pi}{2} = \pi$  Freq.  $\frac{1}{\pi}$

EX. 6)  $f(\theta) = \cos 3(\theta + \frac{\pi}{3})$   
 Phase Shift  $\downarrow \frac{\pi}{3}$  b 3 Period  $\frac{2\pi}{3}$  Freq.  $\frac{3}{2\pi}$

$\frac{1}{2} \cdot \frac{\pi}{2} + \pi$      $\frac{\pi}{2} + \frac{\pi \cdot 2}{2}$      $\frac{1}{2} \cdot \frac{3\pi}{2} + \pi$   
 $\frac{\pi}{4} + \frac{\pi \cdot 4}{1 \cdot 4}$      $\frac{3\pi}{2}$      $\frac{3\pi}{4} + \frac{\pi \cdot 4}{1 \cdot 4}$      $-\frac{\pi}{3}$      $-\frac{\pi}{6}$      $0$      $\frac{\pi}{6}$      $\frac{\pi}{3}$  \*

mult. by  $\frac{1}{2}$      $\uparrow$      $5\pi/4$      $3\pi/2$      $7\pi/4$      $2\pi$  \*  
 add  $\pi$      $\uparrow$

$\frac{\theta}{2} + \pi$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \sin \theta$	0	1	0	-1	0
mult. by -1	0	-1	0	1	0

$\frac{\theta}{3} - \frac{\pi}{3}$	0	$\pi/2$	$\pi$	$3\pi/2$	$2\pi$
$y = \cos \theta$	1	0	-1	0	1

