10.1 – Graphing Sine and Cosine
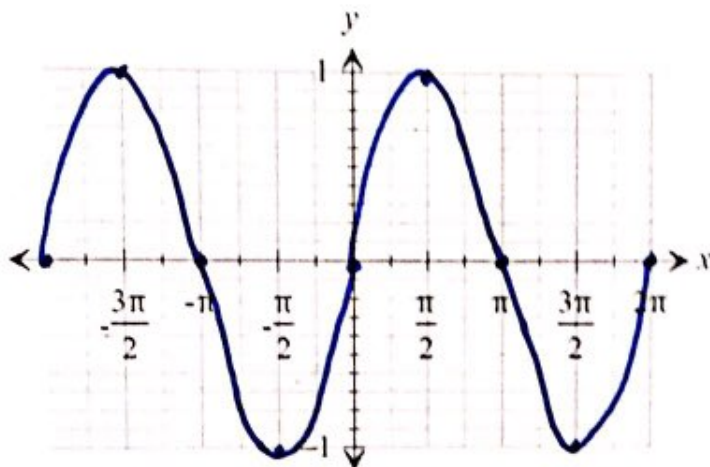
A. Graph Sine and Cosine

Parent sine graph $f(\theta) = \sin\theta$
Draw the graph and make a table.
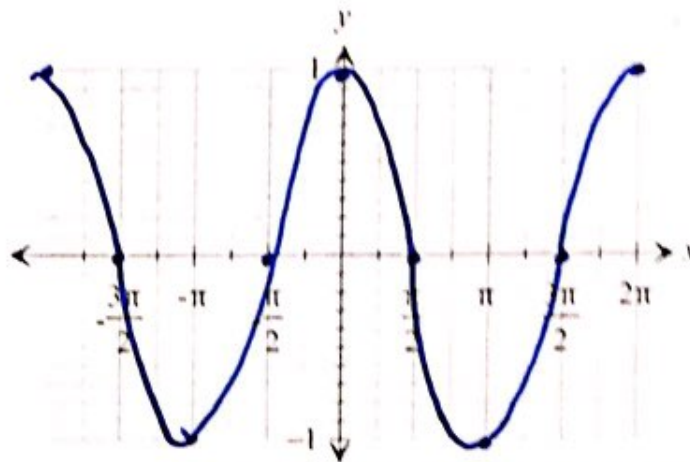

Parent cosine graph $f(\theta) = \cos\theta$
Draw the graph and make a table.

Parent Graph of $y = \sin\theta$

Rad.

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

Parent Graph of $y = \cos\theta$

Rad.

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

B. Transformations

1. What are the 4 types of transformations?
   - **Reflection**
   - **Stretch or Shrink**
   - **Slide / translation** up/down
   - **Rotation** stretch shrink

2. What is the general equation for a trigonometric function?
$$f(x) = a\sin(b(x-c)) + d$$
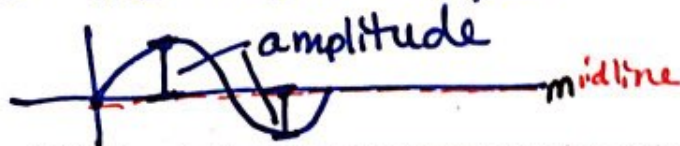$$f(x) = a\cos(b(x-c)) + d$$
* y value changes

Amplitude and Vertical Shift: **Stretch or shrink**

$|a|$
$|A| =$ **amplitude**

Vertical Shift = d
moves graph up or down

The distance from midline of wave (middle) to the max or min point

amplitude
midline

4. Which part of the equation corresponds with a *vertical stretch* (dilation)? **a**
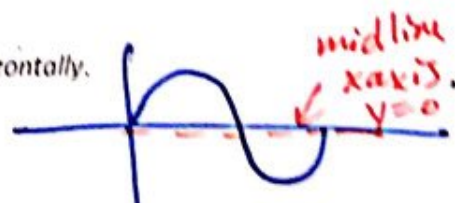   - In the parent graph this is: **1** .

5. Which part of the equation corresponds with a *vertical shift* (translate up or down)? **d**
   - In the parent graph this is: **0** .

6. The **midline** of the graphs of $\sin\theta$ and $\cos\theta$ divide the graph in half *horizontally*.
   - The midline of the of the parent graphs is: **x axis**
   $$y = 0$$

midline
x axis.
y = 0

C. Making the Graph (Amplitude, Midline, Vertical Shift and Reflections)
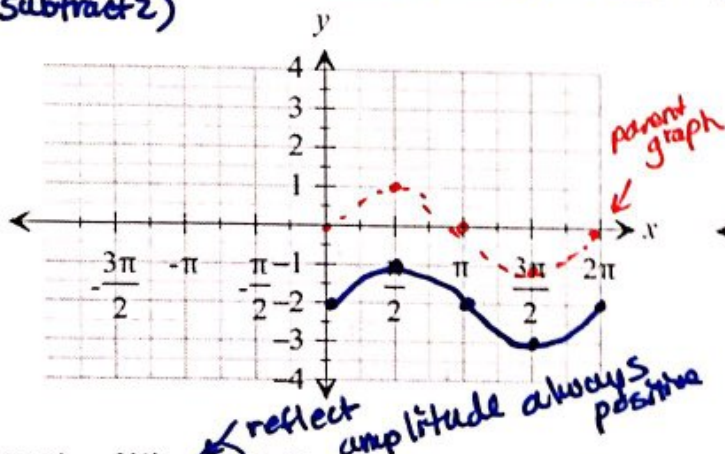
EX. 1) $f(\theta) = |\sin\theta - 2$

Midline $y = -2$ Amplitude ① Vertical Shift down 2

a   d

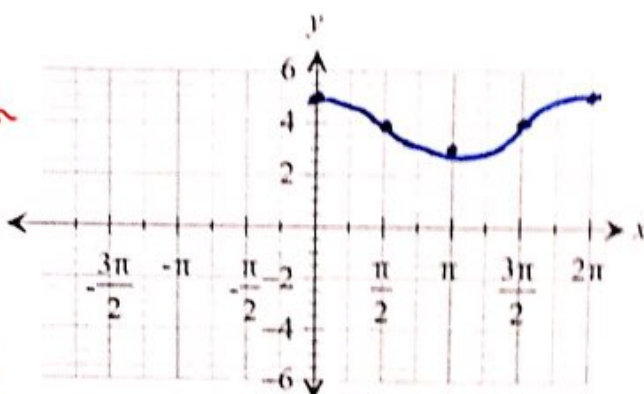| Parent (x) graph θ	0	$\pi/2$	π	$3\pi/2$	2π	*
(y) $y = \sin\theta$	0	1	0	-1	0	
down 2 (Subtract 2)	-2	-1	-2	-3	-2	*

parent graph

reflect amplitude always positive

EX. 2) $f(\theta) = \cos\theta + 4$

Midline $y = 4$ Amplitude 1 Vertical Shift up 4

parent θ	0	$\pi/2$	π	$3\pi/2$	2π	*
$y = \cos\theta$	1	0	-1	0	1	
Add 4	5	4	3	4	5	*

EX. 3) $f(\theta) = -5\sin\theta$

Midline $y = 0$ Amplitude 5 Vertical Shift 0

θ	0	$\pi/2$	π	$3\pi/2$	2π	*
$y = \sin\theta$	0	1	0	-1	0	
mult. by -5	0	-5	0	5	0	*

parent graph

EX.4) $f(\theta) = -2\cos\theta - 3$

Midline $y = -3$ Amplitude 2 Vertical Shift down 3

θ	0	$\pi/2$	π	$3\pi/2$	2π	*
$y = \cos\theta$	1	0	-1	0	1	
mult by -2 Subtract 3	-5	-3	-1	-3	-5	*

1·-2·-3   -1·-2·-3   1·-2·-3

midline