3055 BA SANGAM COLLEGE

PH: 6674003/9264117 E-mail: basangam@connect.com.fj

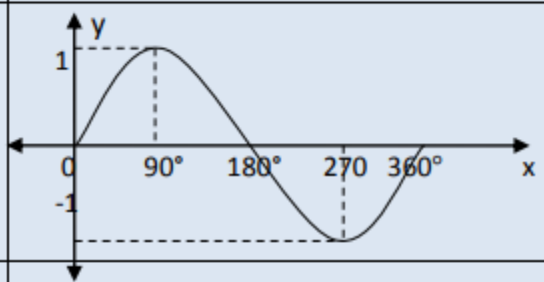
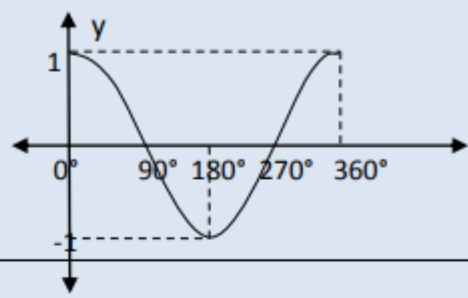
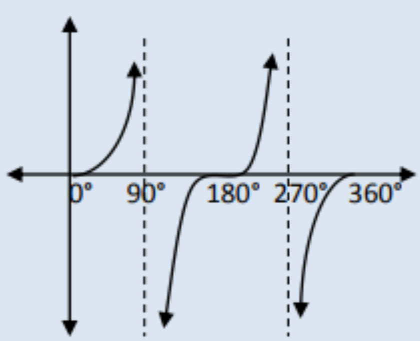
WORKSHEET 22

School: **Ba Sangam College** **Year / Level:** **12**
Subject: **Mathematics** **Name of Student:** _______________

Strand	5 – Trigonometry
Sub strand	5.2 Trigonometric Graphs
Content Learning Outcome	Draw Trigonometric Graphs

Trigonometry **(Ref: Year 12 Mathematics Pg 163 -167)**

Graphs of Basic Trigonometric Functions

Trigonometric	Shape	Period	Range [y values]
$y = \sin x$ $0° \leq x \leq 360°$		$360° or$ $2\pi\ radians$	$-1 \leq y \leq 1$
$y = \cos x$ $0° \leq x \leq 360°$		$360° or$ $2\pi\ radians$	$-1 \leq y \leq 1$
y = tan x $0° \leq x \leq 360°$		$180° or$ $\pi\ radians$	$y \in R$

Note these graphs are functions since domains are not repeated.

Transformation of Trigonometric Graphs

Note: General form of Transforming Trigonometric graphs

$y = A\ Sin\ (Bx \pm C)$ or $y = A\ Cos\ (Bx \pm C)$

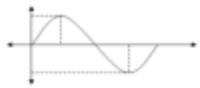
$y = A \ \begin{matrix}\text{Sin}\\ \text{Cos}\end{matrix} \ Bx \pm C$

Amplitude:
The height / distance

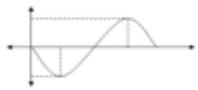
+ *A* means the graph is oriented as usual
– *A* means that the graph is inverted

Shape:

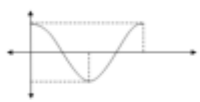
+ A Sin



– A Sin



+ A Cos



– A Cos

Period:
B helps determine the *period* of the graph (the length of the interval needed for the graph of the function to start repeating itself).

$\text{period} = \frac{360}{B} \text{ or } \frac{2\pi}{B}$

C shifts the y-axis or the graph by $\frac{C}{B}$ units.

$+\frac{C}{B}$ shifts the y-axis to the right or the graph moves by $\frac{C}{B}$ units to the left.

$-\frac{C}{B}$ shifts the y-axis to the left or the graph moves by $\frac{C}{B}$ units to the right

While sketching the graph, label clearly the y – intercept, period, amplitude and draw a complete smooth curve. You may use the table method but make sure the shape is complete.

EXAMPLE 1: A trigonometric function is defined by the equation *y = 3 Sin 2 Θ.* Find the amplitude and the period of the function.

General form

Amplitude period

$$y = \underset{\uparrow}{A}\ Sin\ (\underset{\uparrow}{B}x \pm \Theta)$$

Compare $y = 3\ Sin\ 2\ \Theta$

Therefore Amplitude is 3 and the period is $\frac{360}{2} = 180^0 \text{ or } \pi$ radians

EXAMPLE 2: Sketch the following graphs using the table method:

a) $y = \sin x$ b) $y = \sin\left(\frac{1}{2}x\right)$ c) $y = \sin 2x$

Answer [Either in degrees or in radians]

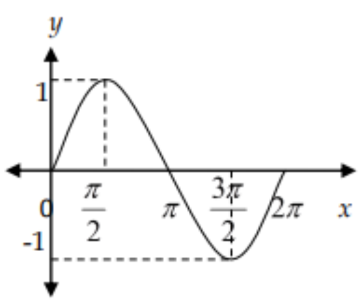
x	$y = \sin x$	(x,y)
0	0	$(0,0)$
$\frac{\pi}{2}$	1	$(\frac{\pi}{2},1)$
π	0	$(\pi,0)$
$\frac{3\pi}{2}$	−1	$(\frac{3\pi}{2},-1)$
2π	0	$(2\pi,0)$

The sine graph completes its shape from 0 to 2π.

x	$y = \sin\left(\frac{1}{2}x\right)$	(x,y)
0	0	$(0,0)$
$\frac{\pi}{2}$	0.7	$(\frac{\pi}{2},0.7)$
π	1	$(\pi,1)$
$\frac{3\pi}{2}$	0.7	$(\frac{3\pi}{2},0.7)$
2π	0	$(2\pi,0)$

Since the period is half, the half of sine graph is shown from 0 to 2π.

x	$y = \sin 2x$	(x,y)
0	0	$(0,0)$
$\frac{\pi}{4}$	1	$(\frac{\pi}{4},1)$
$\frac{\pi}{2}$	0	$(\frac{\pi}{2},0)$
$\frac{3\pi}{4}$	−1	$(\frac{3\pi}{4},-1)$
π	0	$(\pi,0)$
$\frac{5\pi}{4}$	1	$(\frac{5\pi}{4},1)$
$\frac{3\pi}{2}$	0	$(\frac{3\pi}{2},0)$
$\frac{7\pi}{4}$	−1	$(\frac{7\pi}{4},-1)$
2π	0	$(2\pi,0)$



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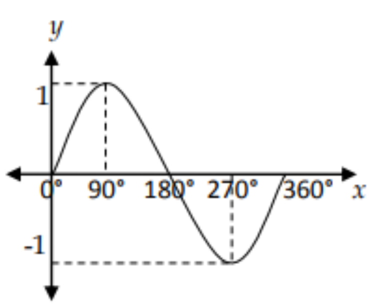

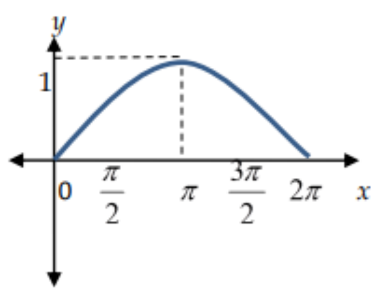

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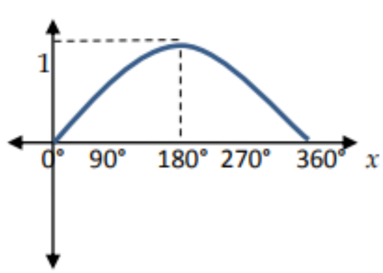
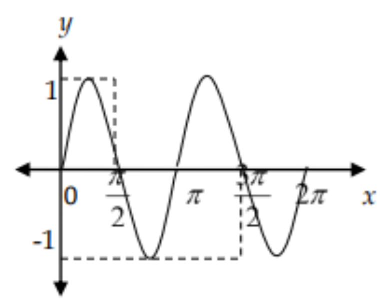


Since the period is doubled, the two complete shape of sine graph is shown from 0 to 2π.



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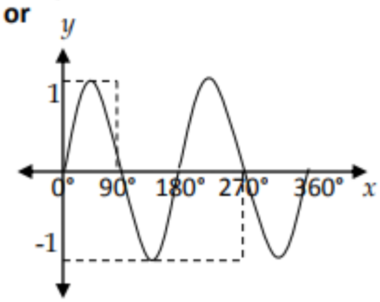
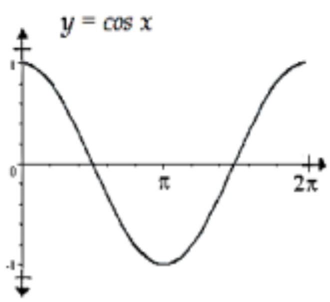


EXAMPLE 3: Sketch the following graphs:

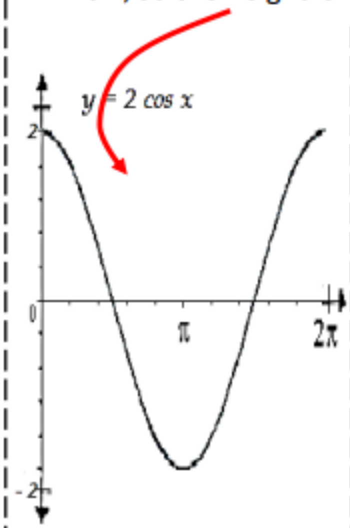
a) $y = \cos x$ b) $y = 2\cos x$ c) $y = -\frac{1}{2}\cos x$

Answer: using the transformation method

Amplitude(A) is 1

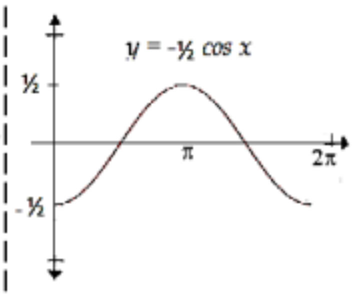


A is 2, so the height is 2



A is $\frac{1}{2}$,

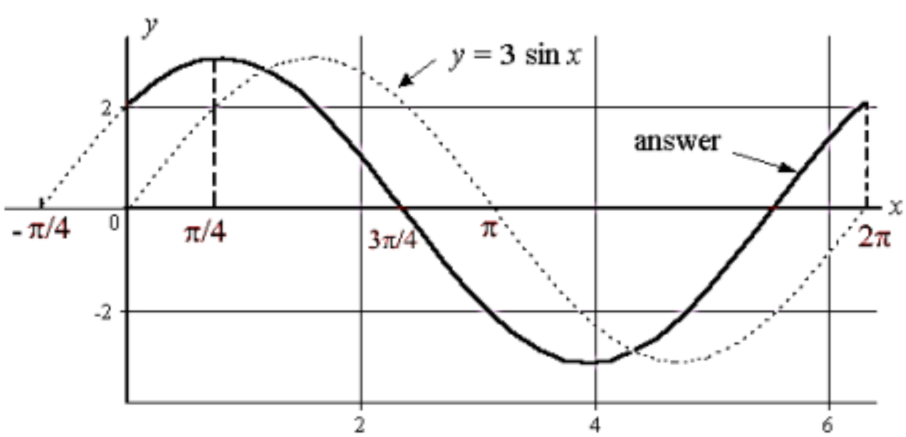
but it's a negative graph



EXAMPLE 4: Sketch $y = 3\sin\left(x + \frac{\pi}{4}\right)$

A=3; B: period=2π;

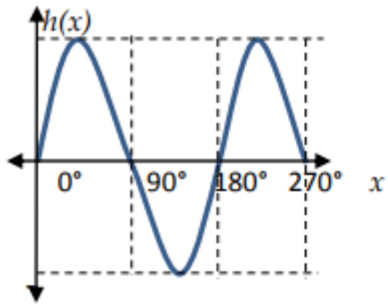
C: Shift the graph $\frac{\pi}{4}$ units to the left or Shift the y-axis by $\frac{\pi}{4}$ units to the right



ACTIVITY: Sketch

1.

The graph of *h(x)* is shown below within the domain $0^o \le \theta \le 270^o$.
Use it to answer the following questions.



i) What is the period of the graph of *h(x)* shown above?
ii) What is the amplitude of *h(x)?*
iii) Write down the equation of *h(x).*

(2 MARKS)

2.

Sketch the following graphs using the domain as $0 \le \theta \le 2\pi$.

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

(2 MARKS)

3.

Sketch the following graphs using the domain as $\mathbf{0^0} \leq x \leq \mathbf{360^0}$.

$y = \cos(2x + 180^0)$

(2 MARKS)

THE END