

Graphs of the Trigonometric Functions :-

Using the Values of the trigonometric functions, we draw their graphs.

Method to draw the Graph :-

The following steps should be adopted. (اختیار کرنا)

- (i) Tabled the ordered pairs of trigonometric functions domain and range.
- (ii) Take domain of function along x -axis
- (iii) Take the range of corresponding domain along y -axis.
- (iv) Join all the points in smooth Curves

Precaution :- (احتیاط)

There must not be any break, sharp corner or line segment within the graph. This property of the Curves is called Continuity.

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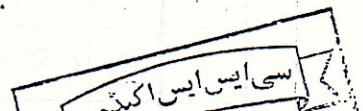
Exercise: 11.2

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Draw the Graph of the following trigonometric functions for the interval mentioned against each function:

"Every Graph is drawn with its particulars along the graph of given trigonometric Function."

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(1) Draw the Graph of $y = \sin x$ for $x \in [-2\pi, 2\pi]$

x	360°	330°	300°	300°	270°	240°	210°	180°	150°	120°	90°	60°	30°
y	0	0.5	0.86	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5
(x, y)													
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0
(x, y)													

NOTE:- In the Empty Spaces write the ordered pairs like $(360^\circ, 0)$

(2) Draw the Graph of $y = \cos x$ for $x \in [-2\pi, 2\pi]$

x	360°	330°	300°	270°	240°	210°	180°	150°	120°	90°	60°	30°	0°
y	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1
(x, y)													
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1
(x, y)													

(3) Draw the Graph of $y = \tan x$ for $x \in [-2\pi, 2\pi]$

x	360°	330°	300°	$270^\circ + 0$	$270^\circ - 0$	240°	210°	180°	150°	120°	$90^\circ + 0$	$90^\circ - 0$	60°	30°	0°
y	0	0.58	1.73	$+\infty$	$-\infty$	-1.73	-0.58	0	0.58	1.73	$+\infty$	$-\infty$	-1.73	-0.58	0
(x, y)															
x	0°	30°	60°	$90^\circ - 0$	$90^\circ + 0$	120°	150°	180°	210°	240°	$270^\circ - 0$	$270^\circ + 0$	300°	330°	360°
y	0	0.58	1.73	$+\infty$	$-\infty$	-1.73	-0.58	0	0.58	1.73	$+\infty$	$-\infty$	-1.73	-0.58	0
(x, y)															

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M.Sc. (Math)
Mob No: 0345-5510779

Questions of Exercise "11-2"

① Draw the Graph of $y = -\sin x$ for $x \in [-2\pi, 2\pi]$

x	360°	330°	300°	270°	240°	210°	180°	150°	120°	90°	60°	30°	0°
y	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1	0.86	0.5	0
(x, y)													
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1	0.86	0.5	0
(x, y)													

② Draw the Graph of $y = 2 \cos x$ for $x \in [0, 2\pi]$

x	0°	30°	60°	90°	120°	150°	180°
y	2	1.73	1	0	-0.5	-1.73	-2
(x, y)	$(0^\circ, 2)$	$(30^\circ, 1.73)$	$(60^\circ, 1)$	$(90^\circ, 0)$	$(120^\circ, -0.5)$	$(150^\circ, -1.73)$	$(180^\circ, -2)$
x	210°	240°	270°	300°	330°	360°	
y	-1.73	-1	0	1	1.73	2	
(x, y)	$(210^\circ, -1.73)$	$(240^\circ, -1)$	$(270^\circ, 0)$	$(300^\circ, 1)$	$(330^\circ, 1.73)$	$(360^\circ, 2)$	

③ Draw the Graph of $y = \sin \frac{x}{2}$ for $x \in [0, 2\pi]$

x	0°	30°	60°	90°	120°	150°	180°
y	0	0.26	0.5	0.707	0.86	0.96	1
(x, y)	$(0^\circ, 0)$	$(30^\circ, 0.26)$	$(60^\circ, 0.5)$	$(90^\circ, 0.707)$	$(120^\circ, 0.86)$	$(150^\circ, 0.96)$	$(180^\circ, 1)$
x	210°	240°	270°	300°	330°	360°	
y	0.96	0.86	0.707	0.5	0.26	0	
(x, y)	$(210^\circ, 0.96)$	$(240^\circ, 0.86)$	$(270^\circ, 0.707)$	$(300^\circ, 0.5)$	$(330^\circ, 0.26)$	$(360^\circ, 0)$	

(10) Draw the Graph of $y = \cos \frac{x}{2}$ for $x \in [-\pi, \pi]$

x	180°	150°	120°	90°	60°	30°	0°
y	0	0.26	0.5	0.707	0.86	0.96	1
(x, y)	$(180^\circ, 0)$	$(150^\circ, 0.26)$	$(120^\circ, 0.5)$	$(90^\circ, 0.707)$	$(60^\circ, 0.86)$	$(30^\circ, 0.96)$	$(0^\circ, 1)$
x	0°	30°	60°	90°	120°	150°	180°
y	1	0.96	0.86	0.707	0.5	0.26	0
(x, y)	$(0^\circ, 1)$	$(30^\circ, 0.96)$	$(60^\circ, 0.86)$	$(90^\circ, 0.707)$	$(120^\circ, 0.5)$	$(150^\circ, 0.26)$	$(180^\circ, 0)$

Q.2 (11) Draw the Graph of $y_1 = \sin x$ and $y_2 = \sin 2x$ for $x \in [-2\pi, 2\pi]$ with Axes and Scale Same.

x	360°	330°	300°	270°	240°	210°	180°	150°	120°	90°	60°	30°	0°
y_1	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0
y_2	0	0.86	0.86	0	-0.86	-0.86	0	0.86	0.86	0	-0.86	-0.86	0
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y_1	0	0.5	0.86	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0
y_2	0	0.86	0.86	0	-0.86	-0.86	0	0.86	0.86	0	-0.86	-0.86	0

Q.2 (12) Draw the Graphs on same axes and scale of $y_1 = \cos x$ and $y_2 = \cos 2x$ where $x \in [-2\pi, 2\pi]$

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x	360°	330°	300°	270°	240°	210°	180°	150°	120°	90°	60°	30°	0°
y_1	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1
y_2	1	0.5	-0.5	-1	-0.5	0.5	1	0.5	0.5	-1	-0.5	0.5	1
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
y_1	1	0.86	0.5	0	-0.5	-0.86	-1	-0.86	-0.5	0	0.5	0.86	1
y_2	1	0.5	-0.5	-1	-0.5	0.5	1	0.5	-0.5	-1	-0.5	0.5	1

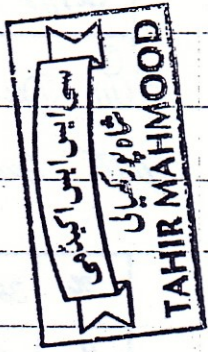
Q.3 (i) Solve Graphically

(13) $\sin x = \cos x$ $x \in [0, \pi]$

x	0°	30°	60°	90°	120°	150°	180°
$\sin x$	0	0.5	0.86	1	0.86	0.5	0
$\cos x$	1	0.86	0.5	0	-0.5	-0.86	-1

From the Graph

Solution is $\{(45, 7.07)\}$



Q.3 (ii) Solve Graphically

(14) $\sin x = x$ $x \in [0, \pi]$

x	0°	30°	60°	90°	120°	150°	180°
$\sin x$	0	0.5	0.86	1	0.86	0.5	0

From the Graph

Solution is $\{(0, 0)\}$

Tahir Mahmood
TAHIR

C.S.S. Academy

(Centre of

Tahir Mahmood

M.Sc. (Math)

Mob No: 0345-6510779

Ph: 0345-6510779

(EXERCISE: 14-2)

① Graph of $\sin x$

$x \in [-2\pi, 2\pi]$ y-axis

$-2\pi \leq x \leq 2\pi$

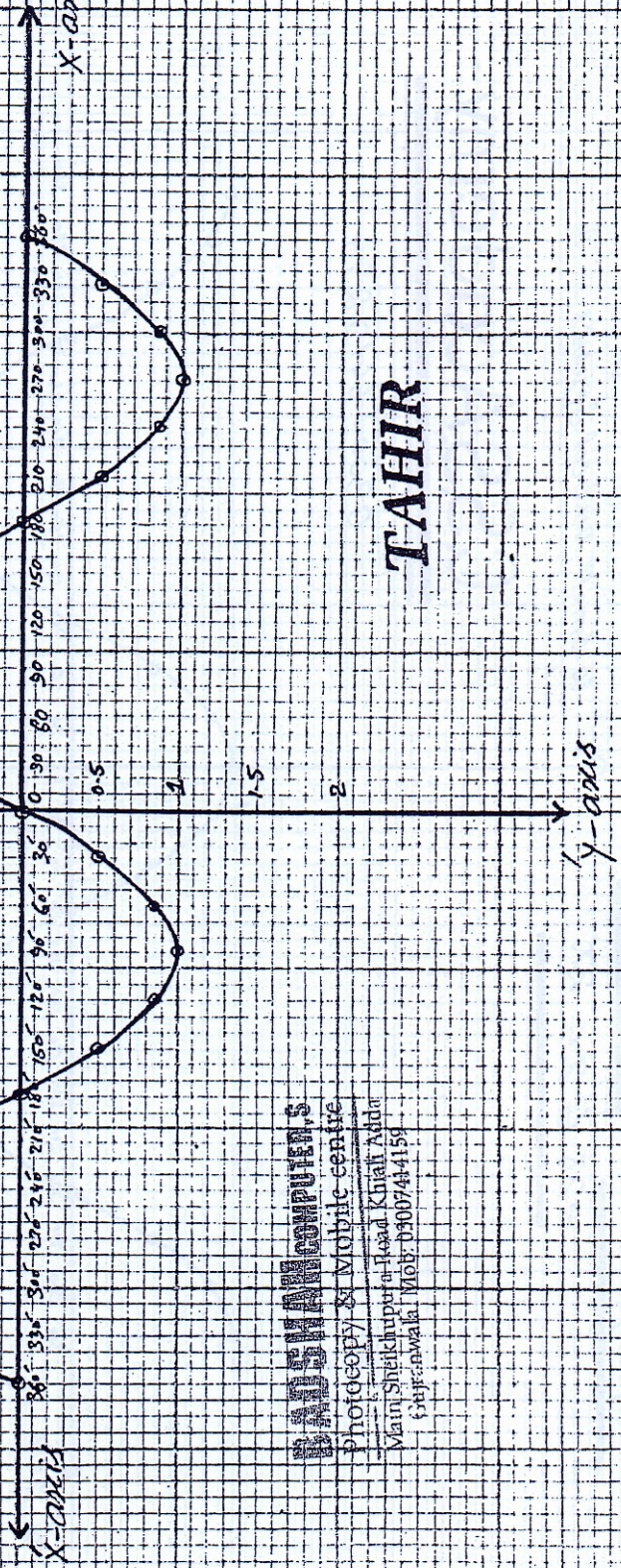
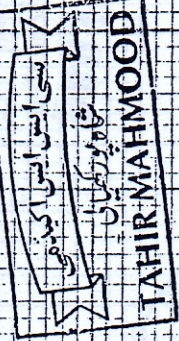
Scale

10 Small Horizontal Squares = 100°

10 Small Vertical Squares = 1

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 Photocopy & Mobile centre
 Main, Sheichpurah Road, Khiali Adan
 6349rc@awala, Mob: 03007441159

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② Graph of $\cos x$

$$x \in [-2\pi, 2\pi]$$

$$-2\pi \leq x \leq 2\pi$$

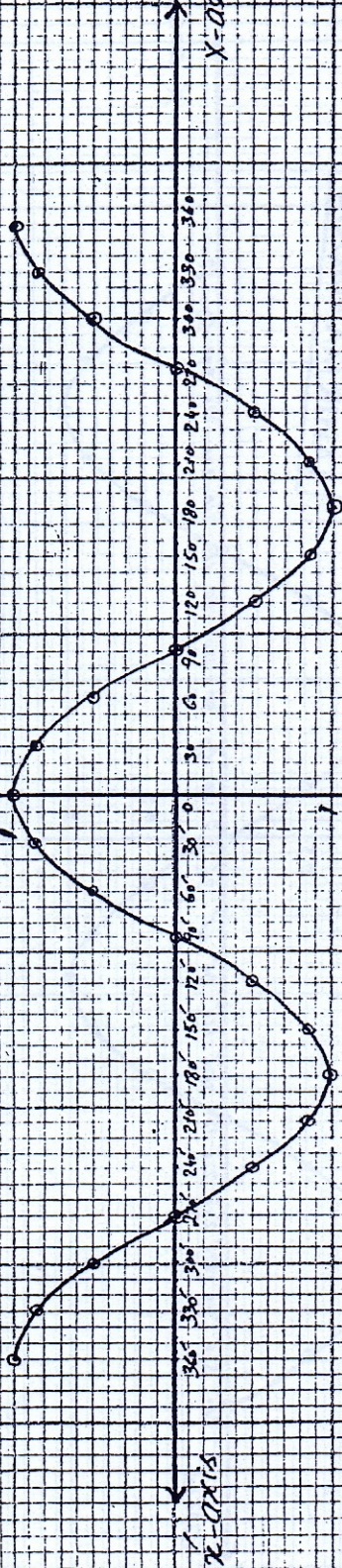
Scale

10 Small Horizontal Squares = 100°

10 Small Vertical Squares = 1

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TAHIR

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Main: Sheikhpurh Road: Khalifa
Ullah: Pwala Mob: 69007414159

③ Graph of $\tan x$

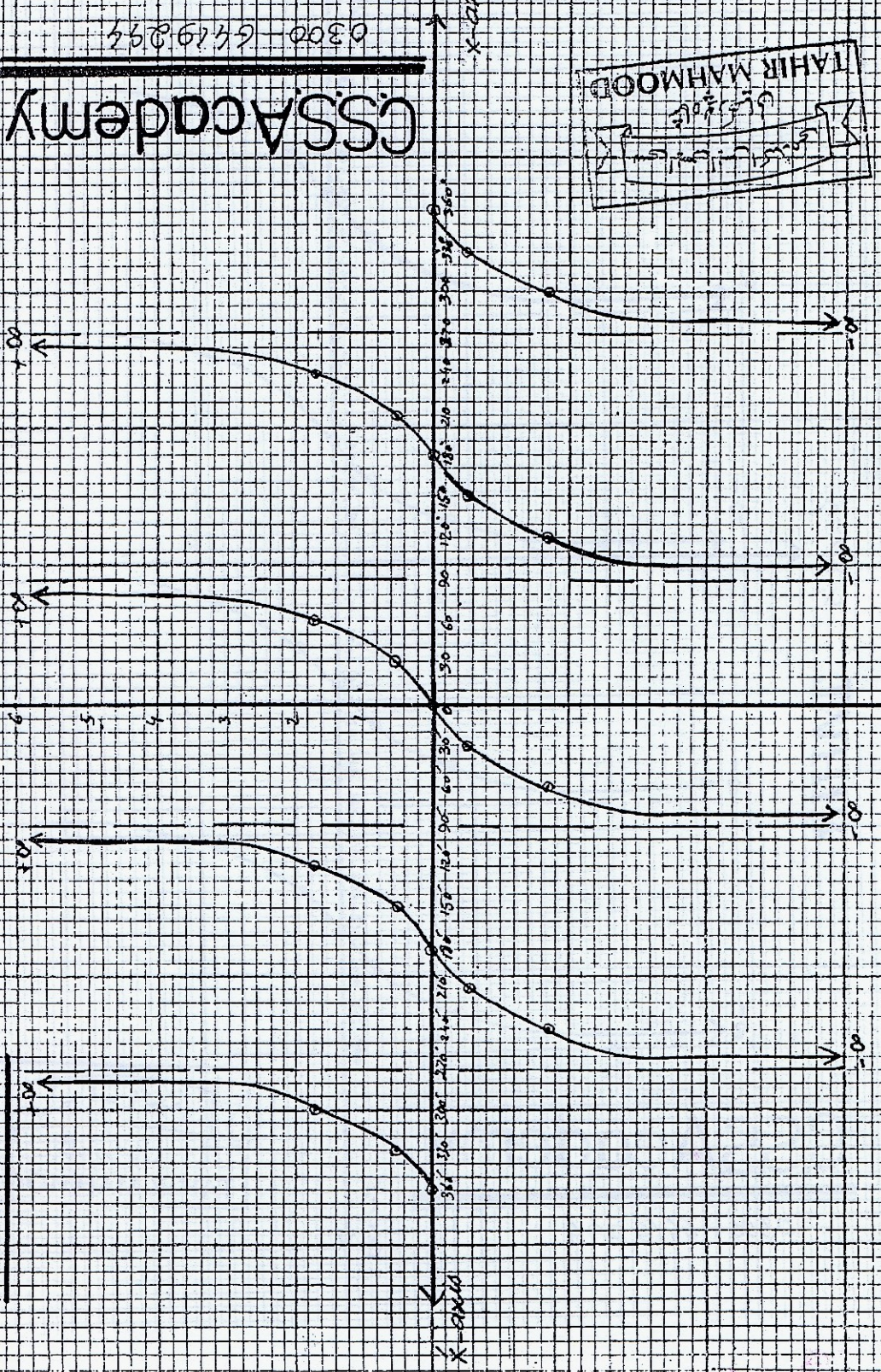
$x \in (-2\pi, 2\pi)$

Scale: 10 small Horizontal Squares = 100°
 10 small Vertical Squares = 2

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$-360^\circ \leq x \leq 360^\circ$



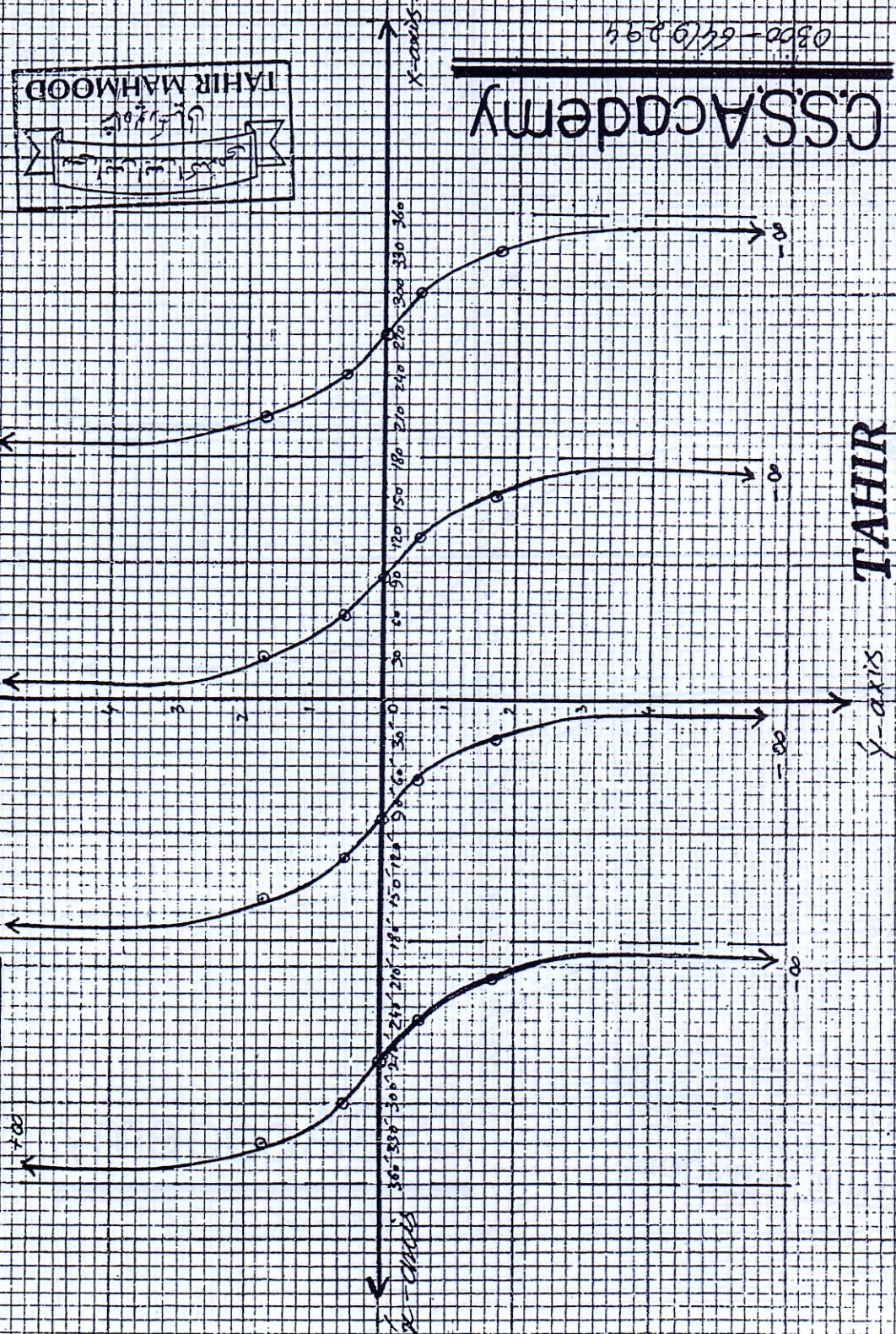
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Graph of Cot x

$$x \in (-2\pi, 2\pi]$$

$$-360^\circ \leq x \leq 360^\circ$$

Scale: 10 small squares along x-axis = 180°
 10 small vertical squares = 2 units



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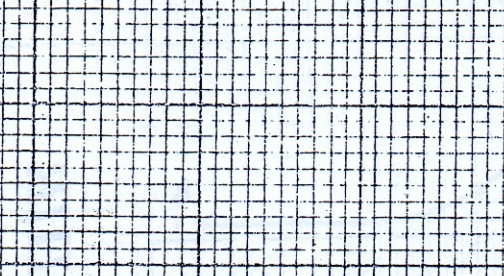
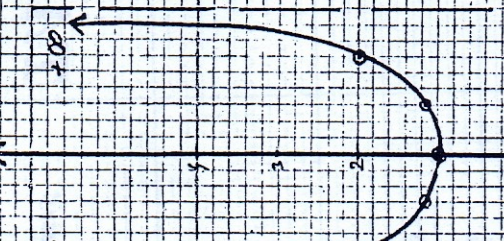
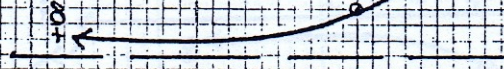
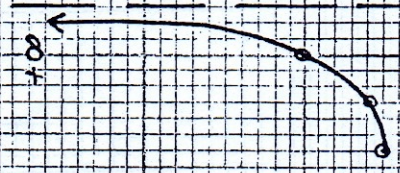
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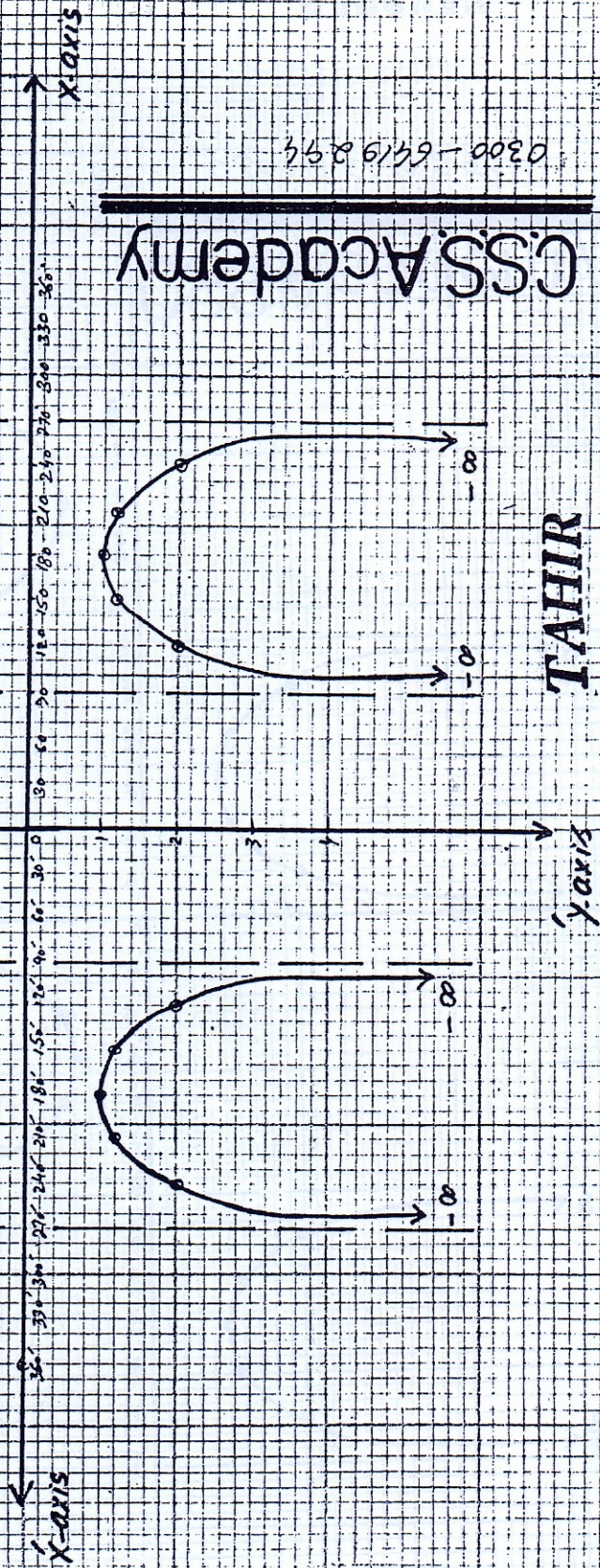
⑤ Graph of Sec x

$x \in [-2\pi, 2\pi]$

$-360^\circ \leq x \leq 360^\circ$



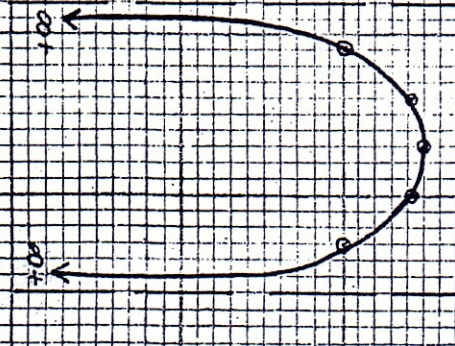
Scale
 10 Small Horizontal Squares = 100
 10 Small Vertical Squares = 2



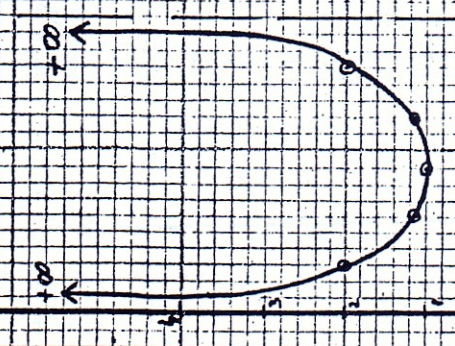
Graph of $\cos \theta$

$x \in [-2\pi, 2\pi]$

$-360^\circ \leq \theta \leq 360^\circ$



y-axis



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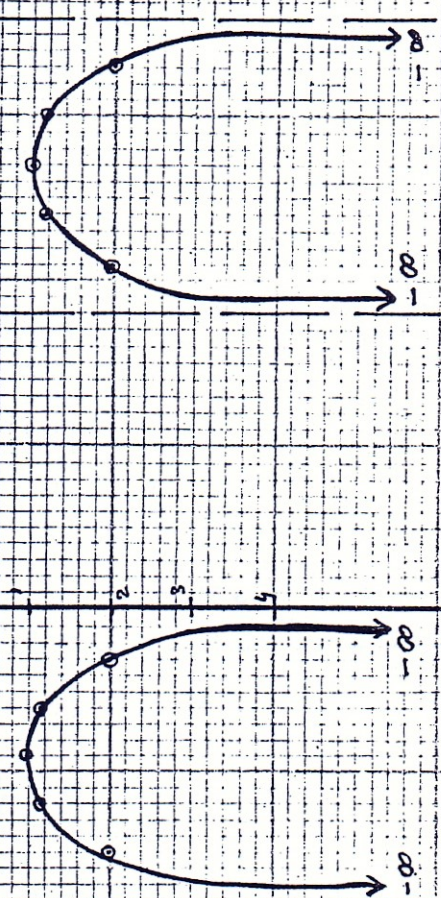
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Scale: 10 small vertical squares = 2 unit

x-axis

x-axis

x-axis



y-axis

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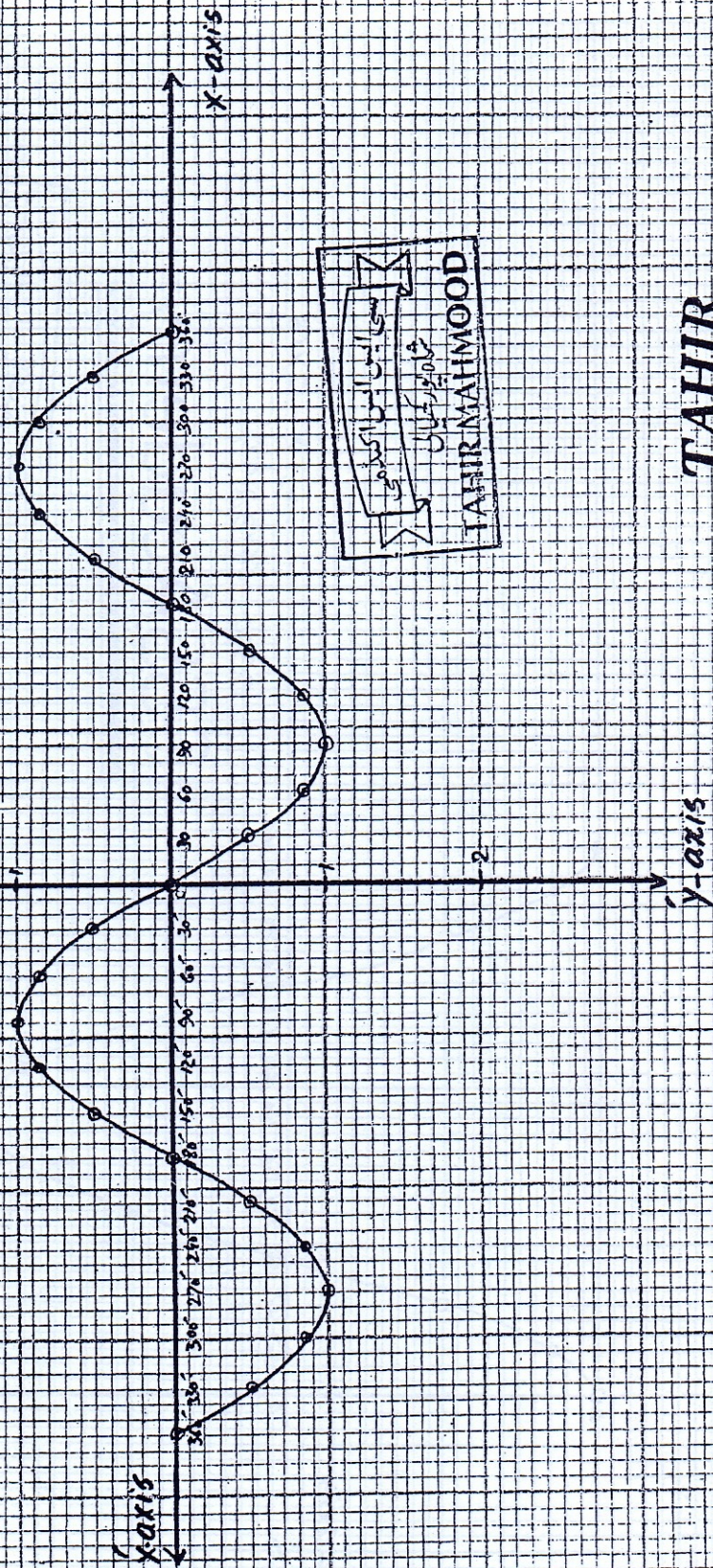
① Graph of $y = \sin x$

$x \in [-2\pi, 2\pi]$

Scale
10 Small Horizontal Squares = 100°
10 Small Vertical Squares = 1

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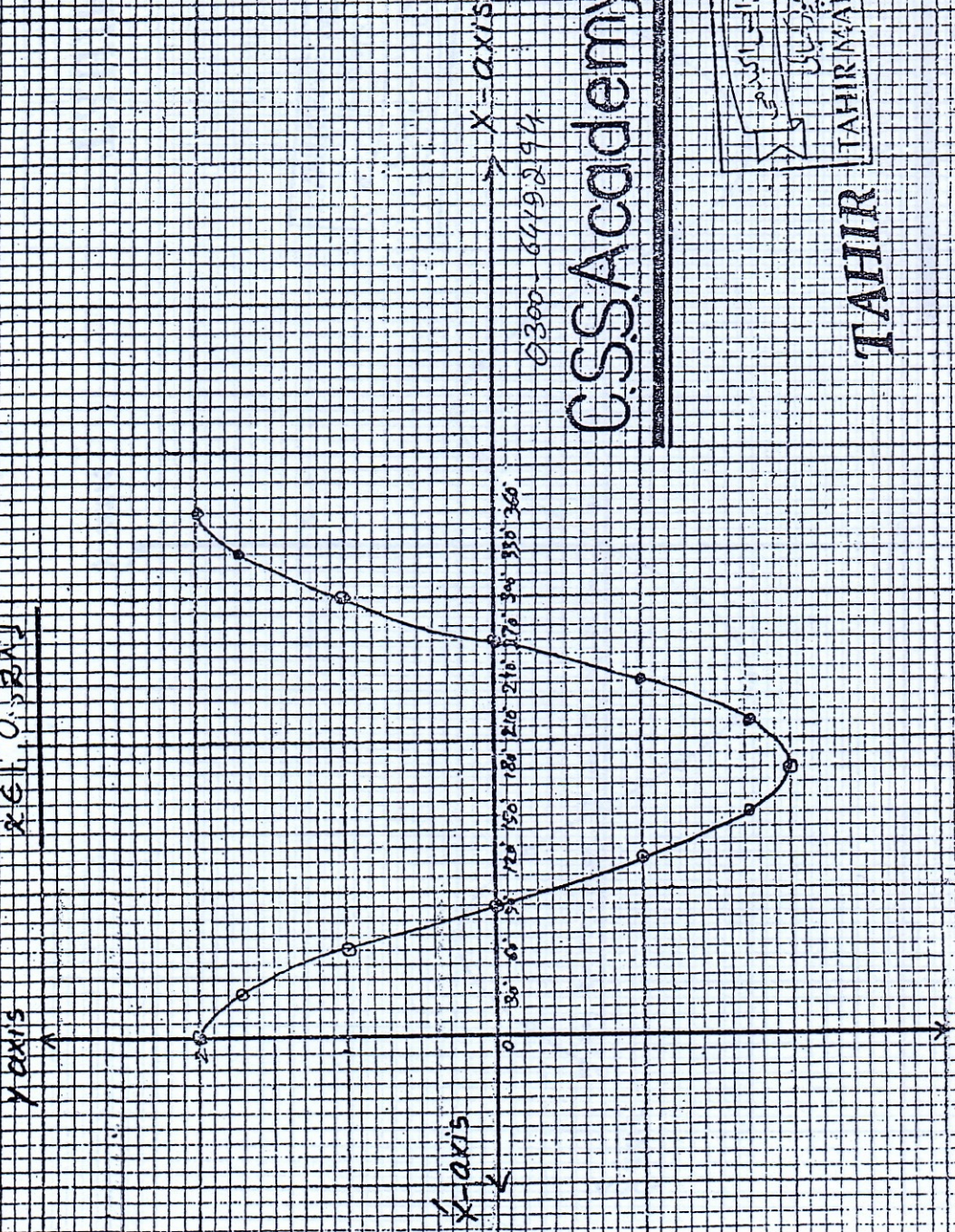
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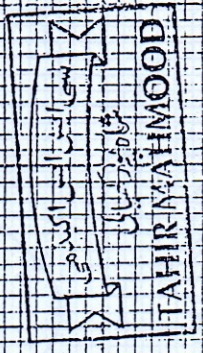
Graph of $y = \sin x$ & $\cos x$
 $x \in [0, 2\pi]$

Scale :-
 10 small Horizontal Squares = 100°
 10 small Vertical Squares = 1



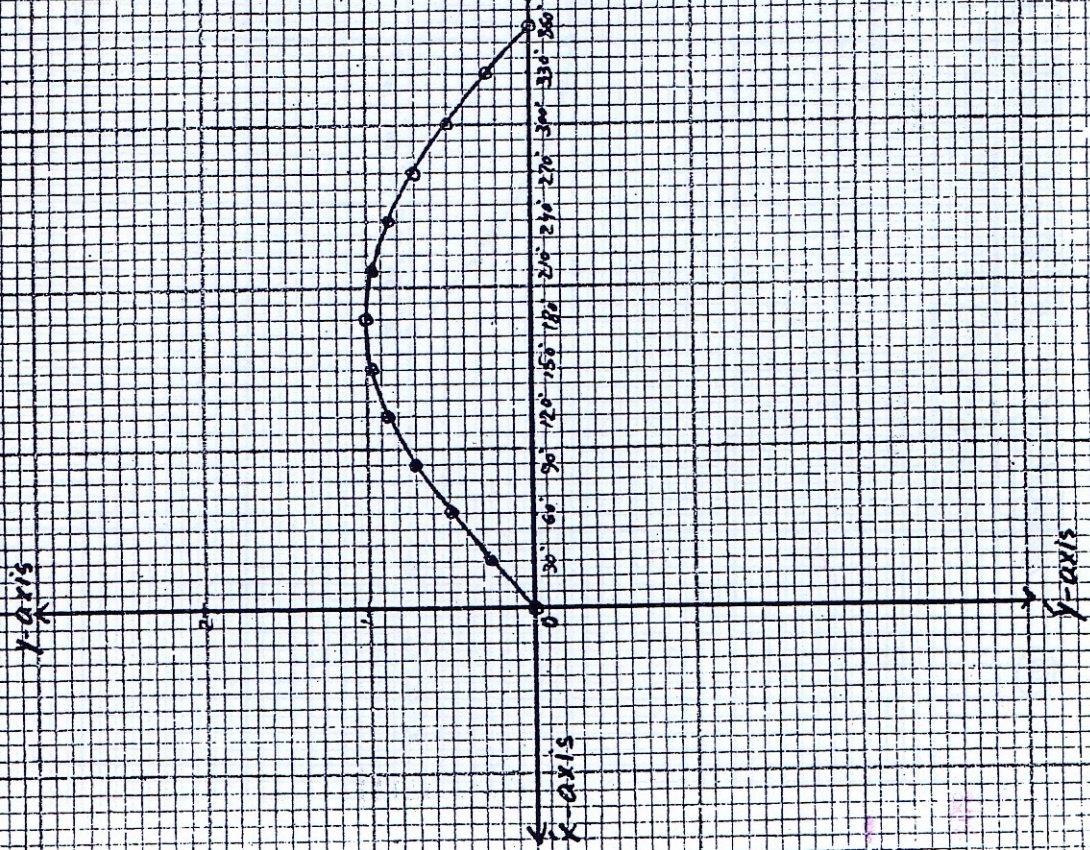
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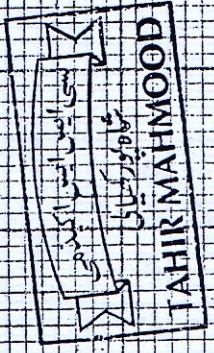
⑨ Graph of $y = \frac{\sin x}{x}$
 $x \in [0, \pi/2]$



Scale:-
 10 Small Horizontal Squares = 100°
 10 Small Vertical Squares = 1 Unit

$0.300 = 6419296$

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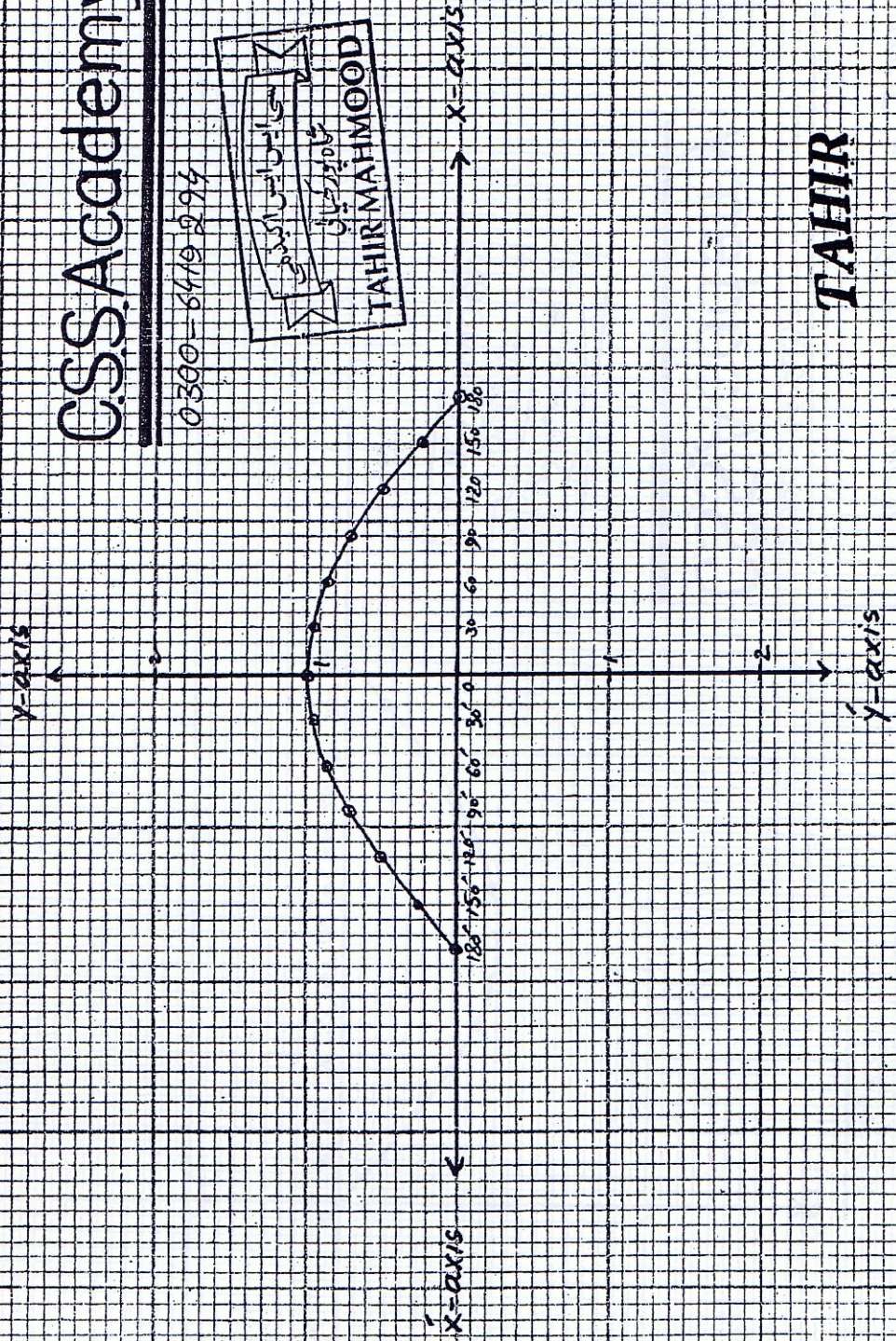


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10) Graph of $y = \cos \frac{x}{2}$

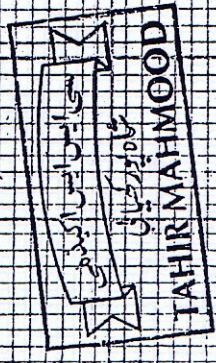
$x \in [-\pi, \pi]$

Scale: 10 Small Horizontal Squares = 100°
10 Small Vertical Squares = 1 Unit.



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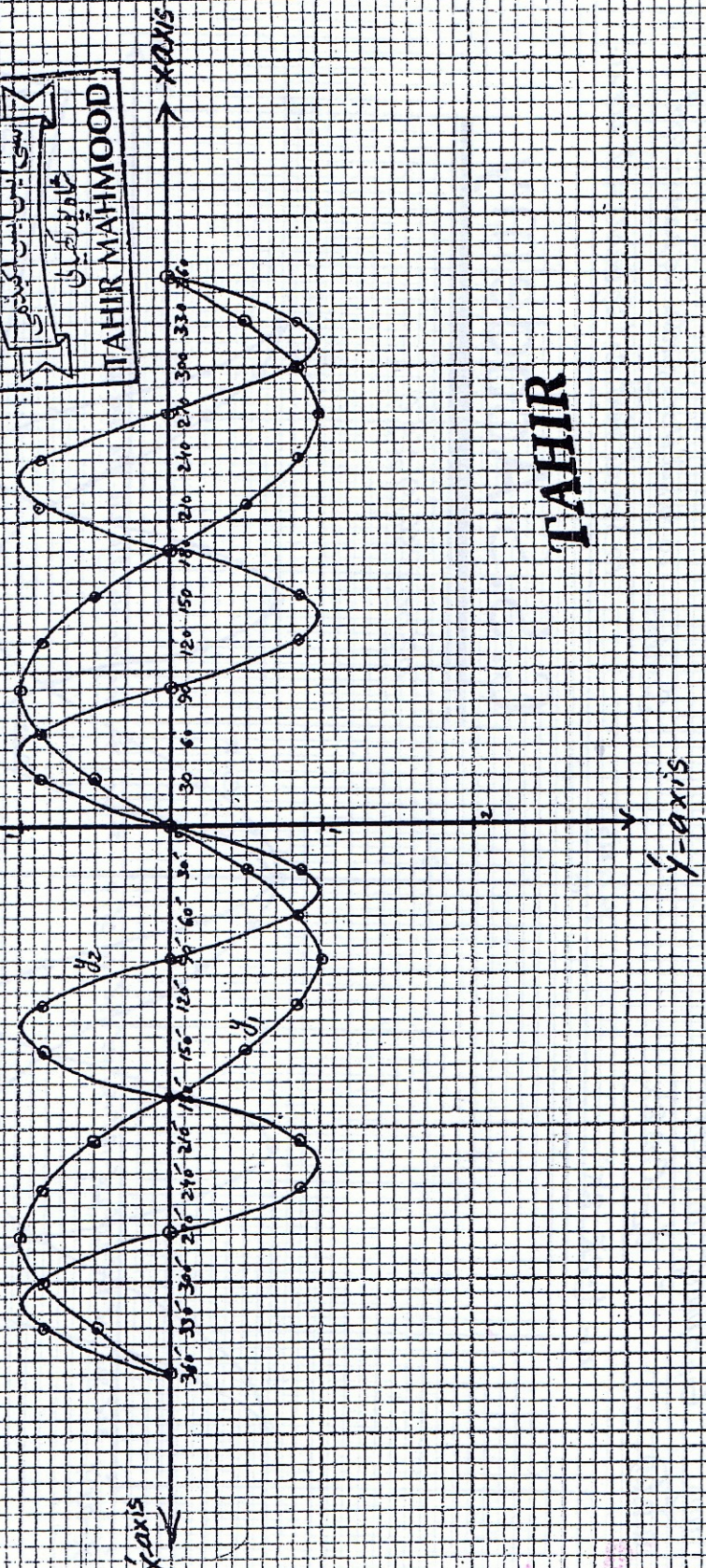
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① Graph of $y_1 = \sin x$
 $y_2 = \sin 2x$
 Q.3 (i) $x \in [-2\pi, 2\pi]$

Scale 10 small Horizontal Squares = 100°
 10 small Vertical Squares = 1 Unit.

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(12)

Graph of $y_1 = \cos x$

$y_2 = \cos 2x$

$x \in [-2\pi, 2\pi]$

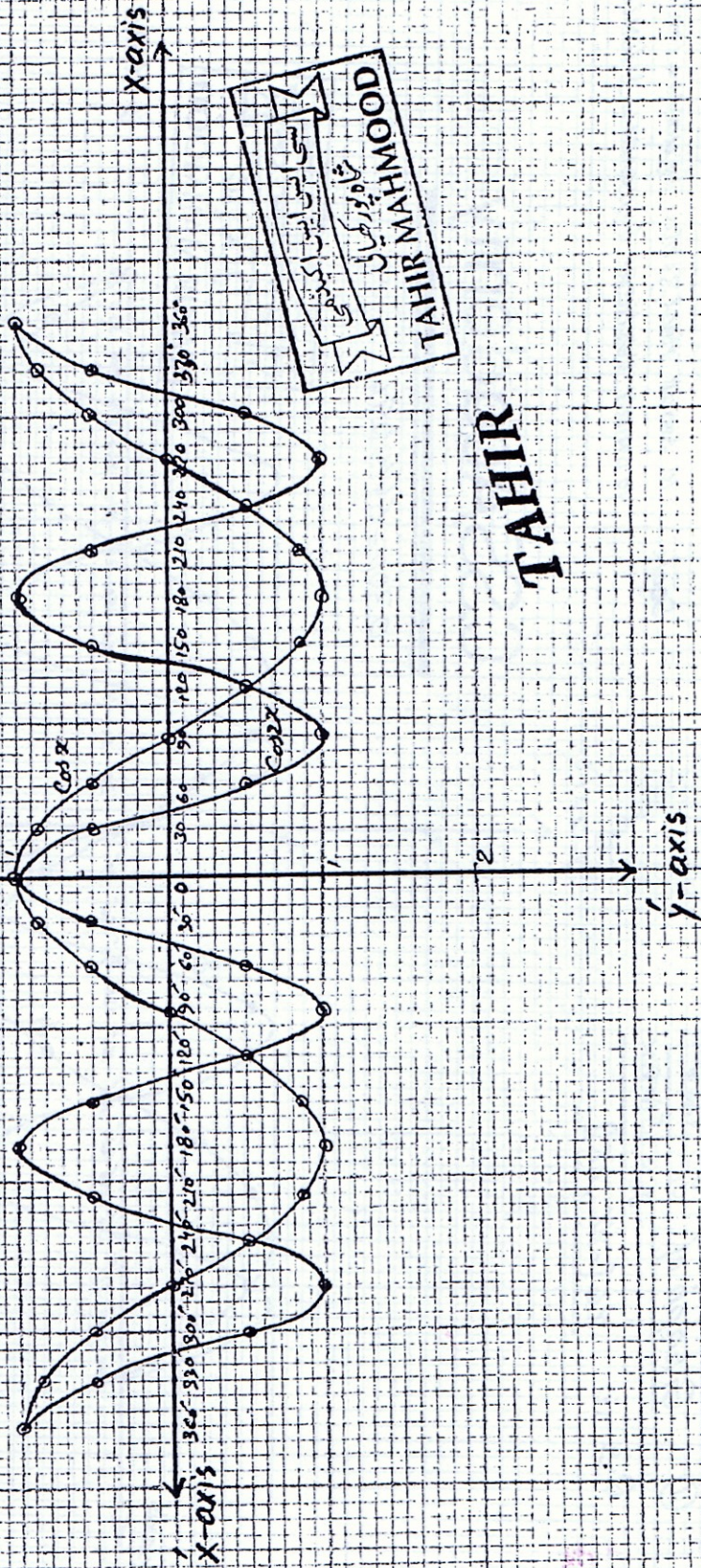
Scale:

10 Small Horizontal Squares = 100°

10 Small Vertical Squares = 1 Unit.

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$$\sin x = \cos x$$

$$x \in [0, \pi]$$

Scale:-

10 small horizontal squares = 50°

10 small vertical squares = 1 unit

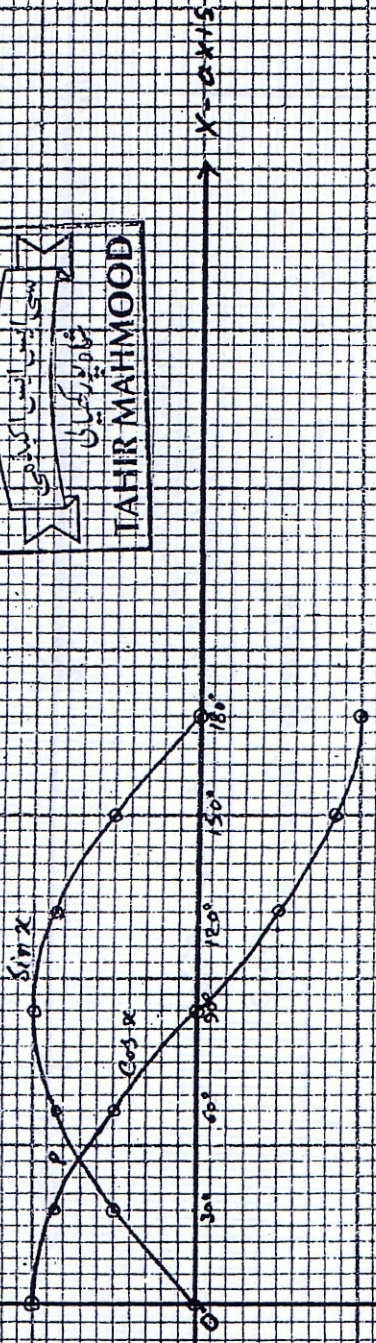
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Y-axis

X-axis



From Graph point of intersection is $P(45^\circ, 0.707)$

Thus Solution by Graph is $(45^\circ, 0.707)$

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Y-axis

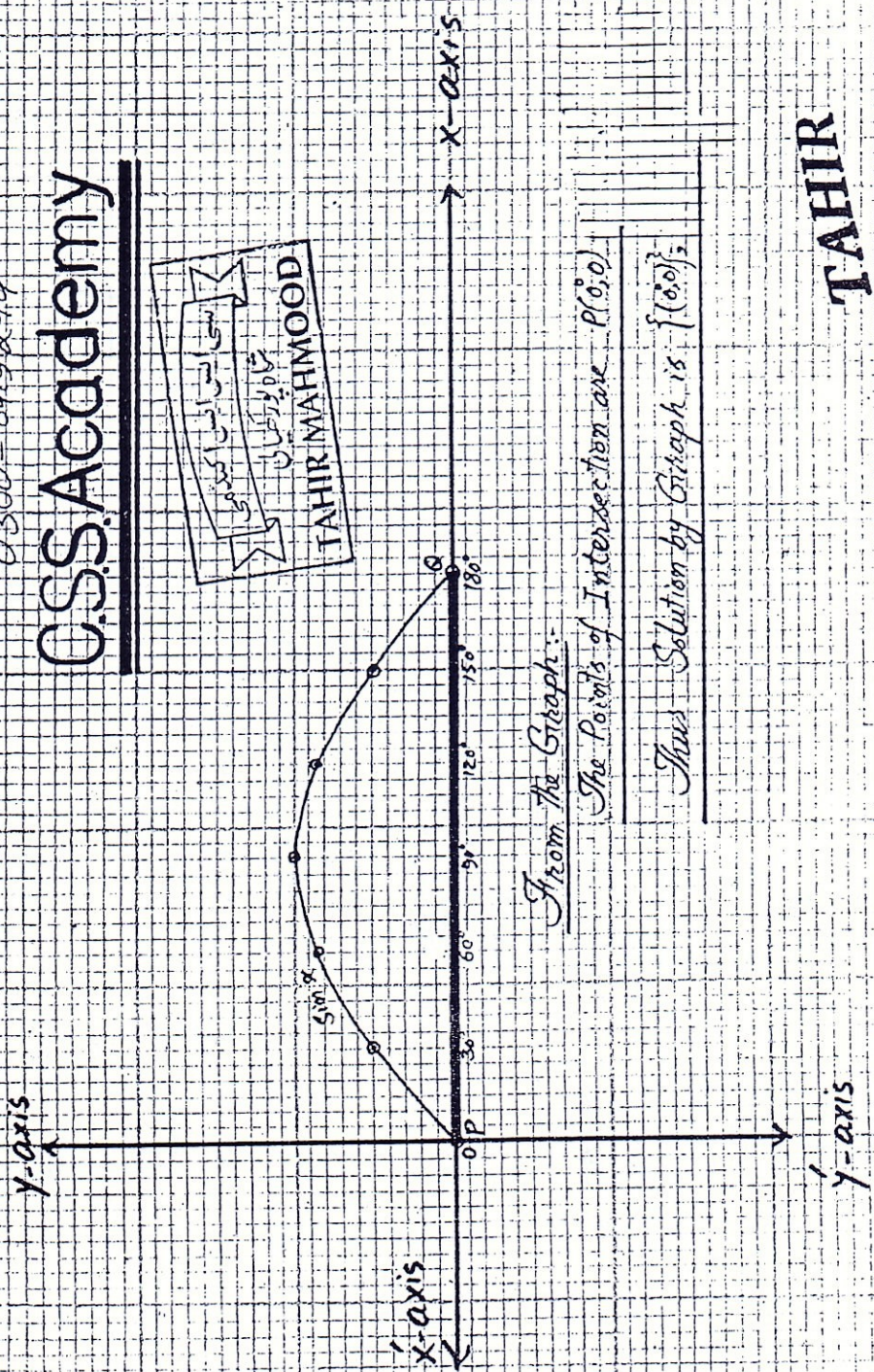
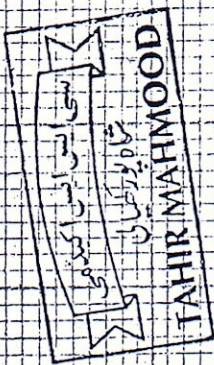
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Graph of $\sin x = x$
 $x \in [0, \pi]$

Scale:
10 small Horizontal Squares = 50°
10 small vertical Squares = 1 unit

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From the Graph:-

The Points of Intersection are $P(0,0)$

Thus Solution by Graph is $\{0,0\}$

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