

## Exercise 11.2

**Q.1** Draw the graph of each of the following equations for the intervals mentioned against each.

- i.  $y = \sin x, X \in [-2\pi, 2\pi]$       ii.  $y = 2 \cos x, X \in [0, 2\pi]$   
 iii.  $y = \tan 2x, X \in [-\pi, \pi]$       iv.  $y = \tan x, X \in [-2\pi, 2\pi]$   
 v.  $y = \sin \frac{x}{2}, X \in [0, 2\pi]$       vi.  $y = \cos \frac{x}{2}, X \in \frac{x}{2} [-\pi, \pi]$

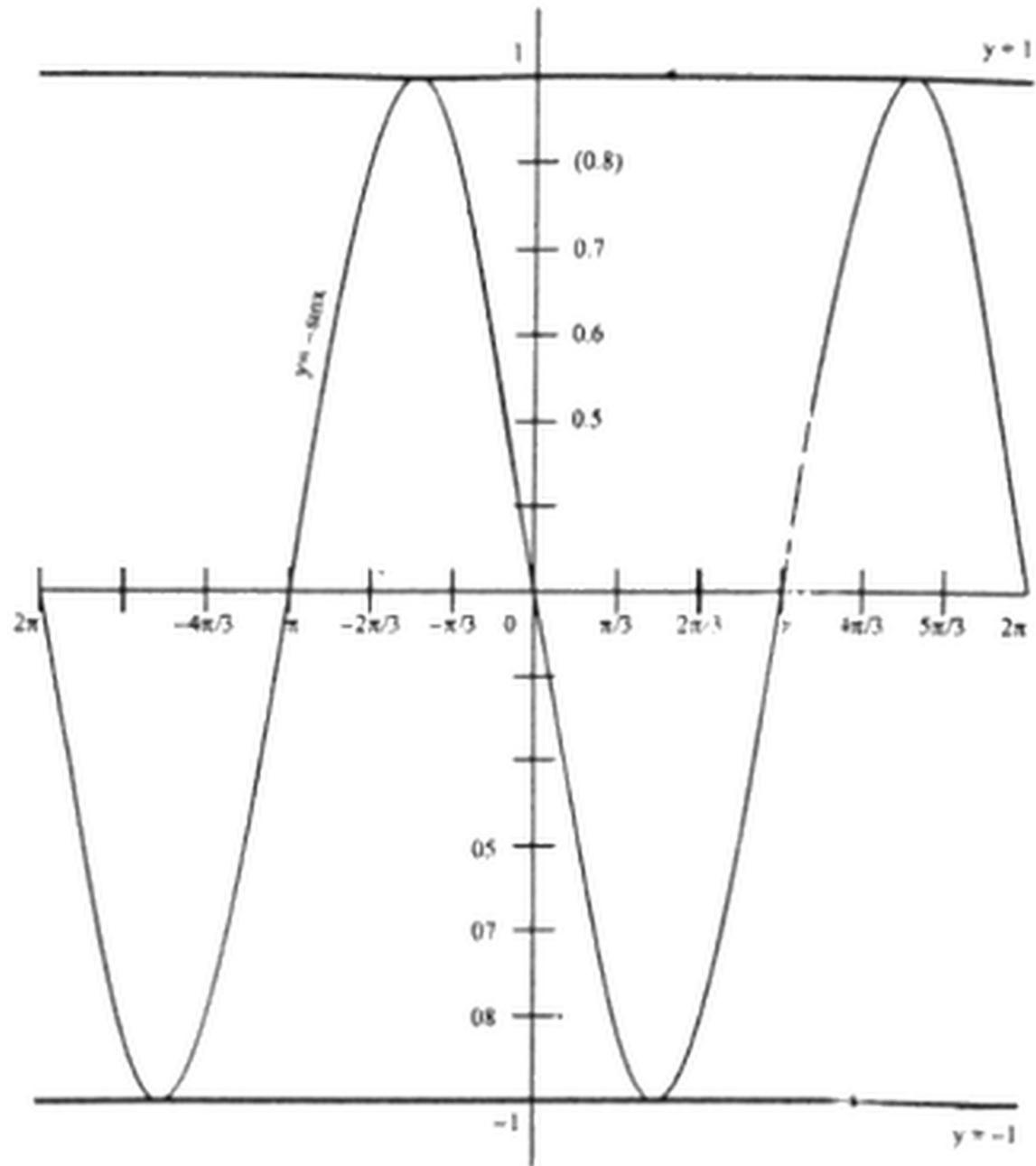
**Solution:**

- i.  $y = -\sin x, X \in [-2\pi, 2\pi]$

Consider the length of each interval we have following table.

$x$	$-2\pi$	$-5\pi/3$	$-4\pi/3$	$-\pi$	$-2\pi/3$	$-\pi/3$
$y = \sin x$	0	-0.87	-0.87	0	0.87	0.87
$y = -\sin x$	0	0.87	0.87	0	-0.87	-0.87

0	$\pi/3$	$2\pi/3$	$\pi$	$4\pi/3$	$5\pi/3$	$2\pi$
0	0.87	0.87	0	0.87	0.87	0
0	-0.87	-0.87	0	-0.87	-0.87	0



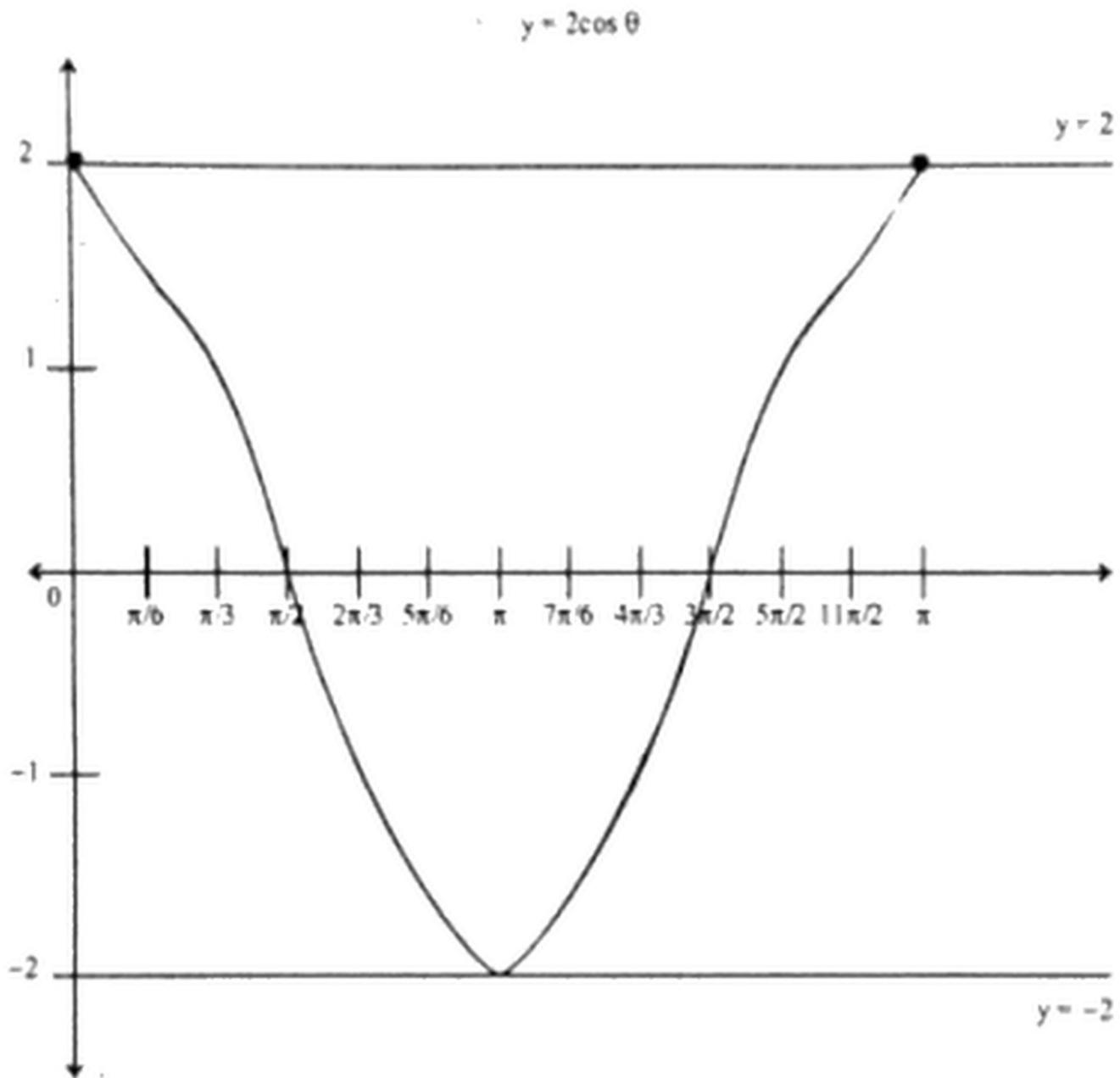
ii.  $y = \sin \frac{x}{2}, \quad X \in [0, 2\pi]$

Consider the sub-interval of length  $\frac{\pi}{6}$ , in the interval 0 to  $2\pi$ .

We will get the following table

$X$	0	$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$5\pi/6$
$\cos x$	1	0.87	0.5	0	-0.5	-0.87
$y = 2 \cos x$	2	1.7	1	0	-1	-1.7

$\pi$	$7\pi/6$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$11\pi/6$	$2\pi$
-1	-0.87	-0.5	0	0.5	0.87	1
-2	-1.7	-1	0	1	1.7	2



iii.  $y = \tan 2x, X \in [\pi, \pi]$

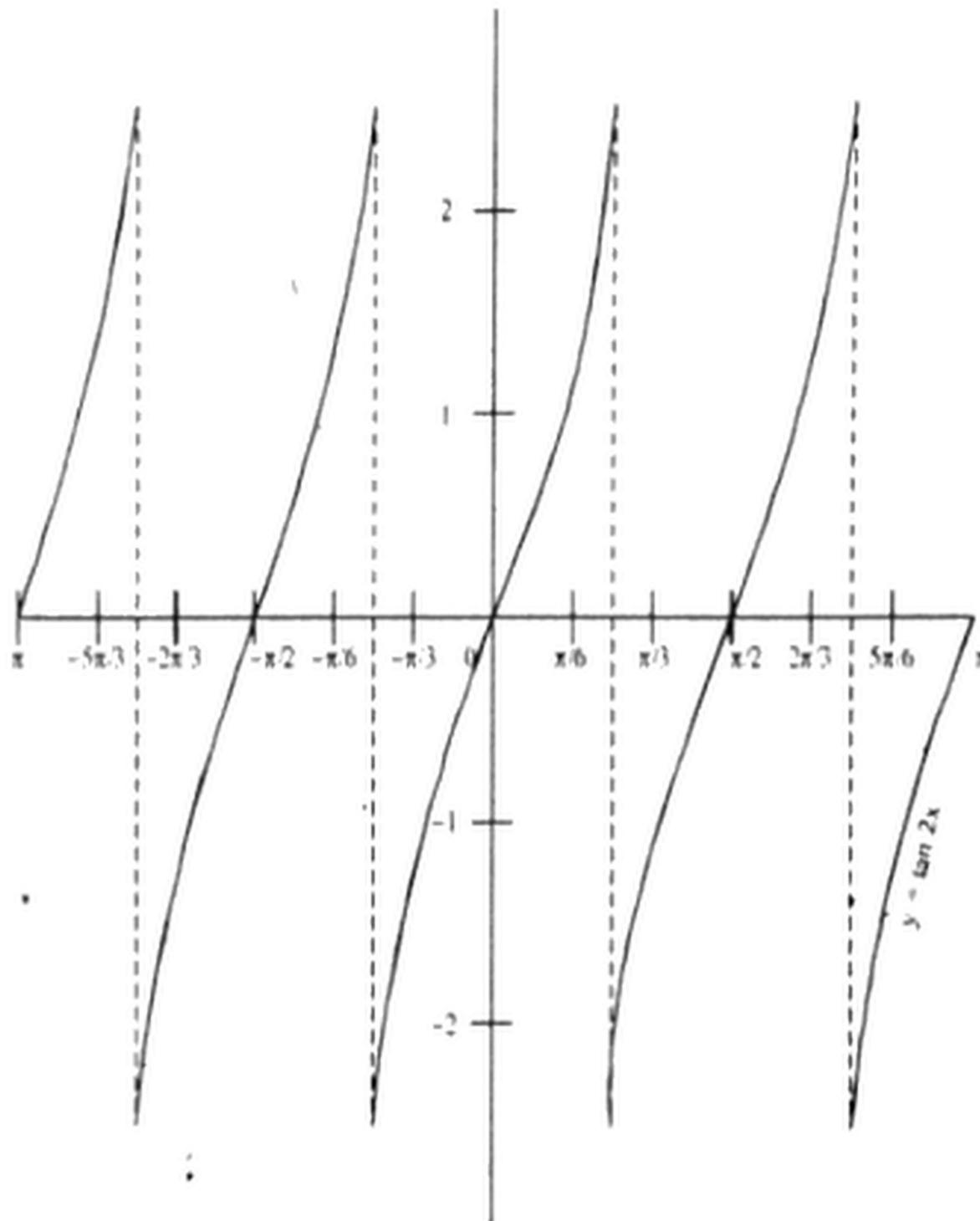
Consider the sub-interval of length  $\frac{\pi}{6}$ , in the interval 0 to  $2\pi$ .

We will get the following table

$X$	$-\pi$	$-5\pi/6$	$-2\pi/...$	$-\pi/2$	$-\pi/3$	$-\pi/6$	0
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$2x$	$-2\pi$	$-5\pi/3$	$-4\pi/3$	$-\pi$	$-2\pi/3$	$-\pi/3$	$0$
$y = \tan m$	$0$	$1.7$	$-1.7$	$0$	$1.7$	$-1.7$	$0$

$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$\pi$
$2x$	$2\pi/3$	$\pi$	$4\pi/3$	$2\pi$
$1.7$	$-1.7$	$0$	$1.7$	$0$



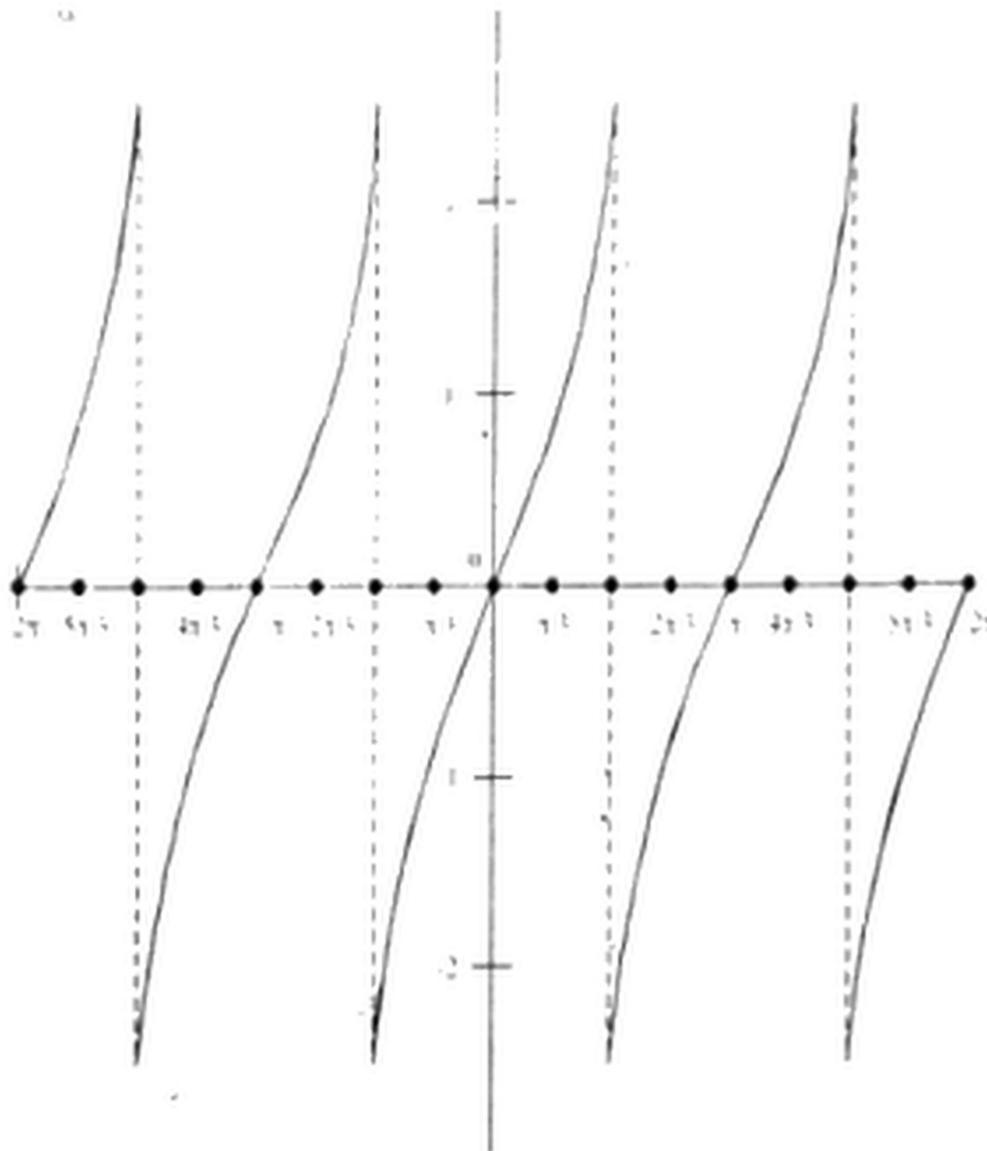
iv.  $y = \tan x, \quad X \in [-2\pi, 2\pi]$

consider of subinterval of each length of  $\pi/3$ .

We have the following table.

$X$	$-2\pi$	$-5\pi/3$	$-4\pi/3$	$-\pi$	$-2\pi/3$
$y = \tan x$	0	1.7	-1.7	0	1.7

$-\pi/3$	0	$\pi/3$	$2\pi/3$	$\pi$	$4\pi/3$	$5\pi/3$	$4\pi$
-1.7	0	1.7	1.7	0	1.7	-1.7	0



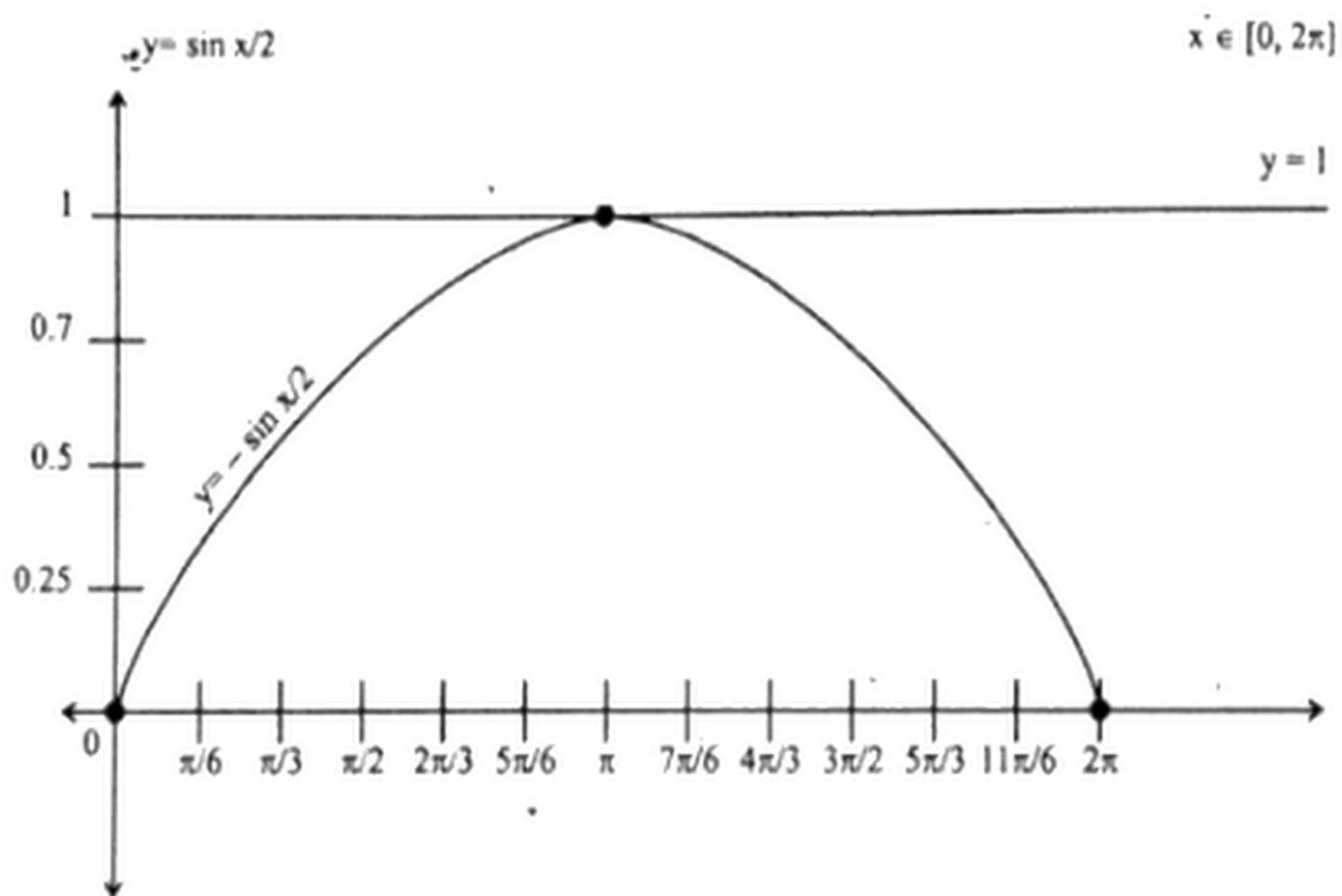
v.  $y = \sin \frac{x}{2} \quad X \in [0, 2\pi]$

consider of subinterval of each length of  $\pi/6$ .

We have the following table.

$x$	0	$\pi/6$	$\pi/3$	$\pi/2$	$2\pi/3$	$5\pi/6$	$\pi$	$7\pi/6$	$4\pi/3$
$x/2$	0	$\pi/12$	$\pi/6$	$\pi/4$	$\pi/3$	$5\pi/12$	$\pi/2$	$7\pi/12$	$2\pi/3$
$y$	0	0.26	0.5	0.71	0.86	0.97	1	0.97	0.87

$3x/2$	$5\pi/3$	$11\pi/6$	$2\pi$
$3x/4$	$5\pi/6$	$11\pi/12$	$\pi$
0.71	0.5	0.26	0



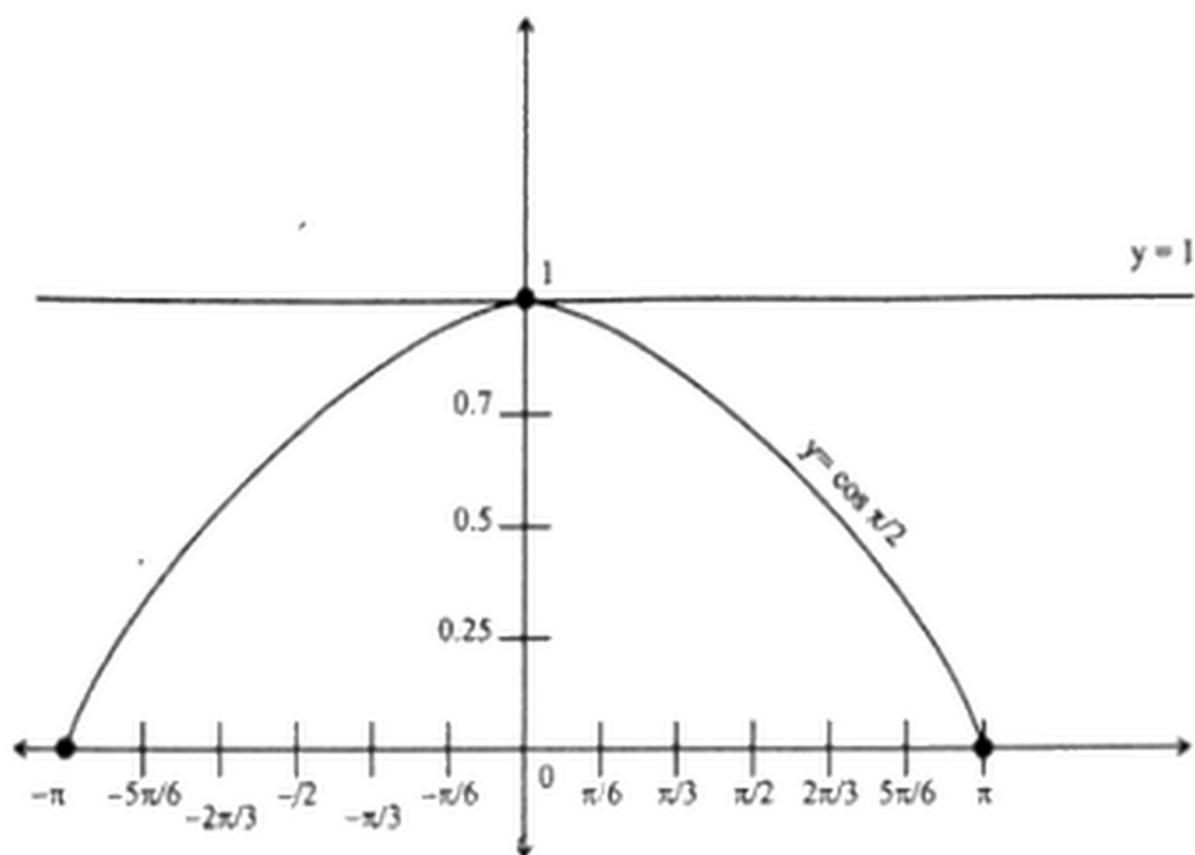
vi.  $y = \cos \frac{x}{2} \quad X \in [-\pi, \pi]$

consider of subinterval of each length of  $\frac{\pi}{6}$ .

We have the following table.

$x$	$-\pi$	$-\frac{5\pi}{6}$	$-\frac{2\pi}{3}$	$-\frac{\pi}{2}$	$-\frac{\pi}{3}$	$-\frac{\pi}{6}$	$0$
$x/2$	$-\frac{\pi}{2}$	$-\frac{5\pi}{12}$	$-\frac{\pi}{3}$	$-\frac{\pi}{4}$	$-\frac{\pi}{6}$	$-\frac{\pi}{12}$	$1$
$y = \cos x/2$	$0$	$0.26$	$0.5$	$0.71$	$0.87$	$0.97$	$1$

$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	$-\pi$
$\frac{\pi}{12}$	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$-\frac{5\pi}{12}$	$-\frac{\pi}{2}$
$0.97$	$0.87$	$0.71$	$0.5$	$0.26$	$0$



Q.2 On the same axes and to the same scale, draw the graphs of the following equation for their complete period.

i.  $y = \sin x$  and  $y = \sin 2x$       ii.  $y = \cos x$  and  $y = \cos 2x$

**Solution:**

i.  $y = \sin x$  and  $y = \sin 2x$

Consider the sub-interval of length  $\pi/6$ .

For the interval of  $\{0, 2\pi\}$ .

We have the following table.

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$
$y = \sin x$	0	0.5	0.707	0.866	1	0.866	0.70

$5\pi/6$	$\pi$	$7\pi/6$	$5\pi/4$	$4\pi/3$	$3\pi/2$	$5\pi/3$
0.5	0	-0.5	-0.707	-0.866	-1	-0.866

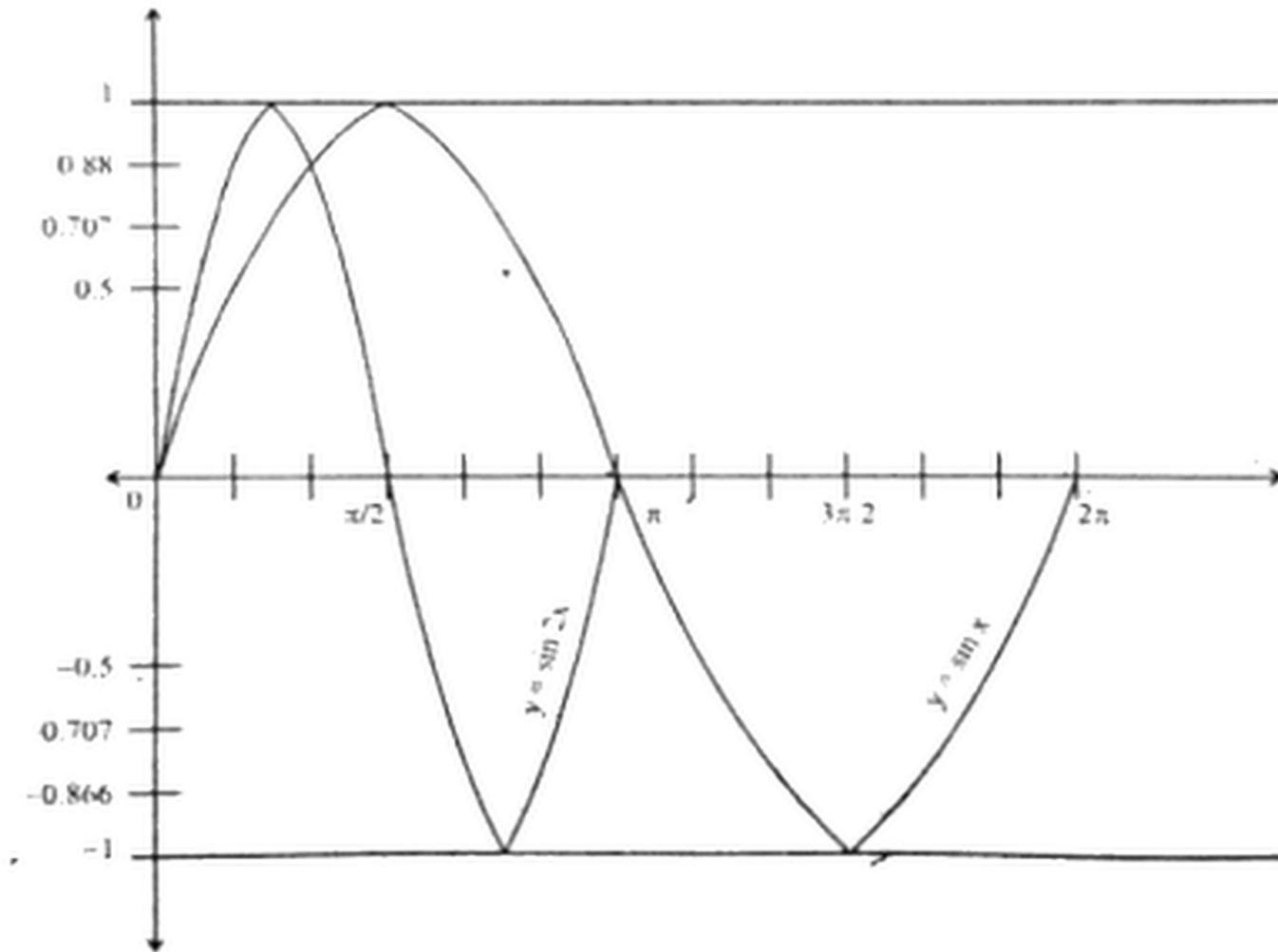
$7\pi/4$	$11\pi/6$	$2\pi$
-0.707	-0.5	0

Consider the sub interval of length  $\pi/6$  for the interval of  $\{0, 2\pi\}$ .

We have the following table.

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$
$2x$	0	$\pi/3$	$\pi/2$	$2\pi/3$	$\pi$	$4\pi/3$
$y = \sin x$	0	0.866	1	0.866	0	-0.866

$3\pi/4$	$5\pi/6$	$\pi$
$3\pi/2$	$5\pi/3$	$2\pi$
-1	0.866	0



**ii.  $y = \cos x$  and  $y = \cos 2x$**

Consider the sub interval of length  $\pi/6$  for the interval of  $\{0, 2\pi\}$ .

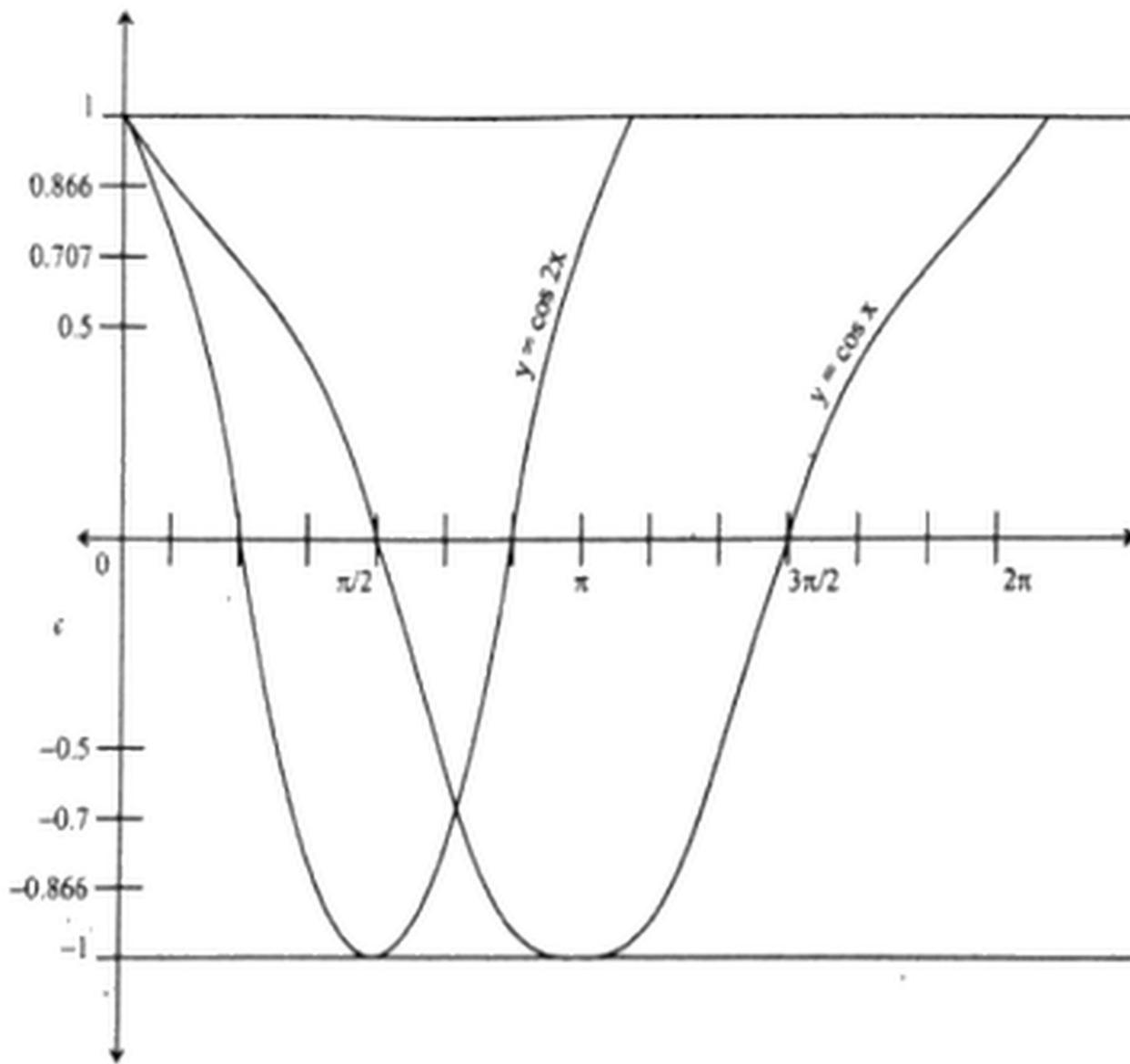
We have the following table.

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/3$	$5\pi/6$	$\pi$
$\cos x$	1	0.866	0.707	0.5	0	0.5	0.707	0.866	-1

	$5\pi/4$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$7\pi/4$	$11\pi/6$	$2\pi$
-0.866	0.707	-0.5	0	0.5	0.707	0.866	1

Consider the sub-interval of  $\pi/6$  for the interval of  $\{0,2\}$

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	$\pi$
$2\pi$	0	$\pi/3$	$\pi/2$	$2\pi/3$	$\pi$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$2\pi$
$\cos x$	1	0.5	0	-0.5	-1	-0.5	0	0.5	1



**Q.3 Solve graphically.**

i.  $\sin x = \cos x$ ;  $X \in [0, \pi]$

ii.  $\sin x = x$ ;  $X \in [0, \pi]$

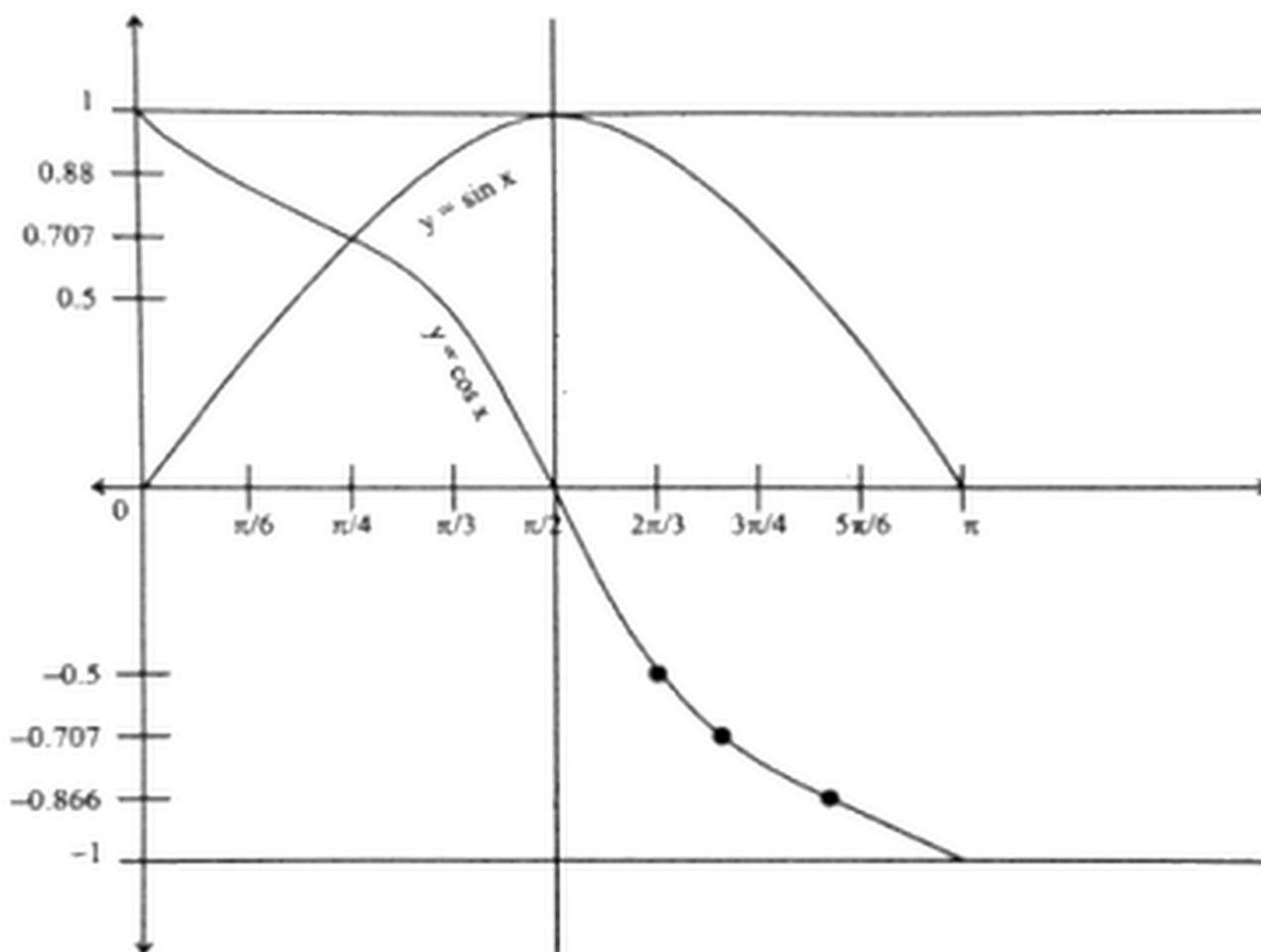
**Solution:**

i.  $\sin x = \cos x$ ;  $X \in [0, \pi]$

Consider the subinterval of  $\pi/2$  for the interval  $[0, \pi]$

We get the following table.

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	$\pi$
$\sin x$	0	0.5	0.707	0.866	1	0.866	0.707	0.5	0
$\cos x$	1	0.866	0.707	0.5	0	-0.5	-0.707	0.866	1



ii.  $\sin x = x$  ;  $X \in [0, \pi]$

consider the subinterval  $\pi/6$  for the interval  $[0, \pi]$

we have the following table

$x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	$\pi$
$y = x$	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	$\pi$
$y = \sin x$	0	0.5	0.707	0.86	1	0.5	0.707	0.866	0

