

ex: find exact value of  $\theta$  trig  $f(x)$

$$\sin \theta = 1/3 = 4/12 \quad \cos \theta < 0$$

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$\left(\frac{1}{3}\right)^2 + \cos^2 \theta = 1$$

$$\cos^2 \theta = 1 - 1/9$$

$$\cos \theta = \sqrt{8/9}$$

$$= \pm \frac{2\sqrt{2}}{3}$$

$$\tan \theta = \frac{1/3}{-2\sqrt{2}/3} = -\frac{1}{2\sqrt{2}}$$

$$\cot \theta = 2\sqrt{2}$$

$$\sec \theta = -3/2\sqrt{2} \cdot \frac{\sqrt{2}}{\sqrt{2}} = -\frac{3\sqrt{2}}{4}$$

$$\csc \theta = 3$$

symmetric  
about  
y-axis

even-odd function

even:  $f(-x) = f(x)$

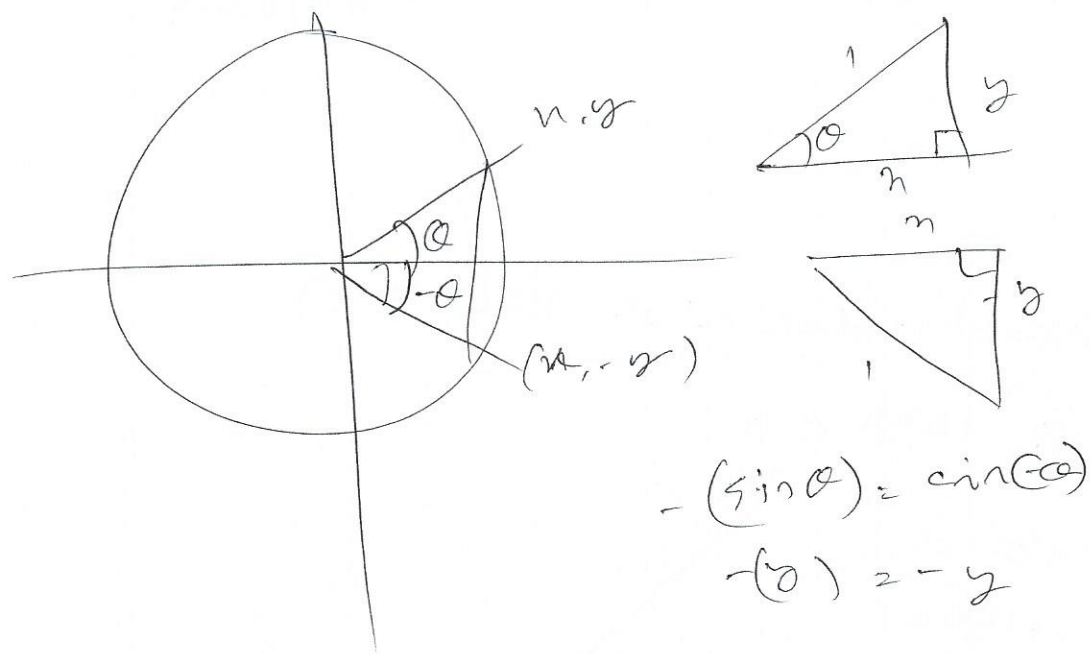
odd:  $f(-x) = -f(x)$

symmetric about origin

cosine, secant

sine, cosecant

tangent, cotangent



$$\cos(-\theta) = \cos \theta$$

$$x = x$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\sec(-\theta) = \frac{1}{\cos(-\theta)}$$

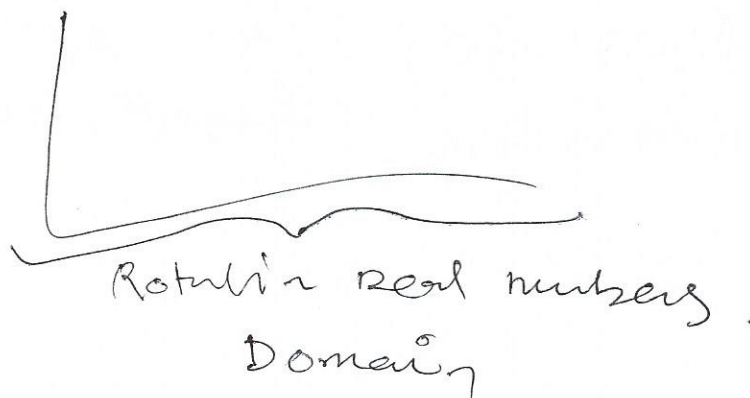
### 7.4 graphs of sine, cosine

Change notation from  $\sin \theta$

$$f(x) = y = \sin x \rightarrow x \in \mathbb{R}$$

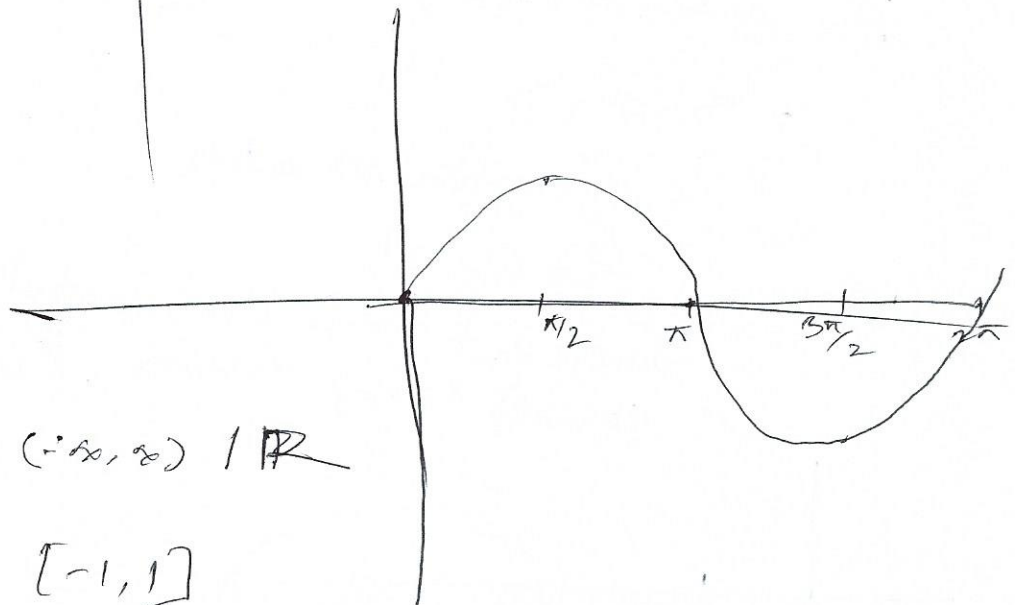
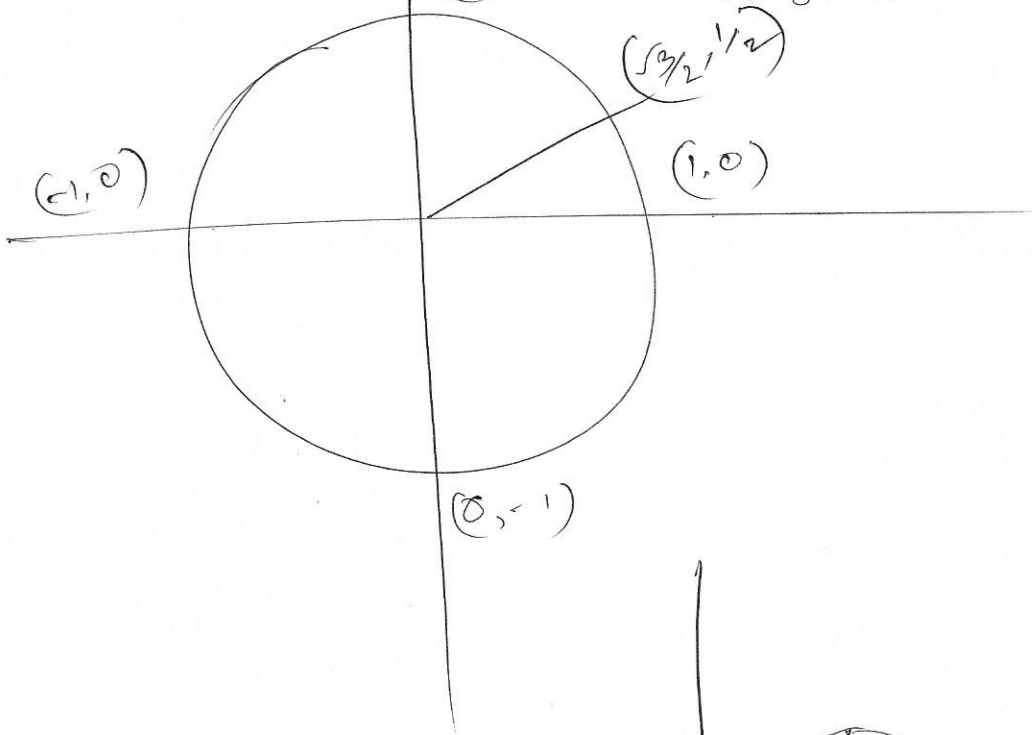
take all notations & assign them to horizontal, x-axis,

Range  
 sin values



$x$	$y$	$(x, y)$
0	0	(0, 0)
$\pi/6$	$1/2$	$(\pi/6, 1/2)$
$\pi/2$	1	$(\pi/2, 1)$
$5\pi/6$	$1/2$	$(5\pi/6, 1/2)$
$\pi$	0	$(\pi, 0)$
$7\pi/6$	$-1/2$	$(7\pi/6, -1/2)$
$3\pi/2$	-1	$(3\pi/2, -1)$
$11\pi/6$	$-1/2$	
$2\pi$	0	

unit circle is an aid to find trig values.



Dom:  $(-\infty, \infty) / \mathbb{R}$

Range:  $[-1, 1]$

odd  $f(x)$

max value of 1

occurs at

$$x = \frac{\pi}{2}, \frac{5\pi}{2}, \frac{9\pi}{2}, \dots$$

$$\frac{\pi}{2} + 2k\pi, \quad k \in \mathbb{Z}$$

min value of -1

occurs at

$$x = \frac{3\pi}{2}, \frac{7\pi}{2}, \frac{11\pi}{2}, \dots$$

$$x = \frac{3\pi}{2} + 2k\pi, \quad k \in \mathbb{Z}$$

x-intercepts

$$x = 0, \pi, 2\pi, 3\pi, 4\pi$$

$$x = k\pi, \quad k \in \mathbb{Z}$$

$$y = A \sin(\omega x)$$

$$= 3 \sin x$$

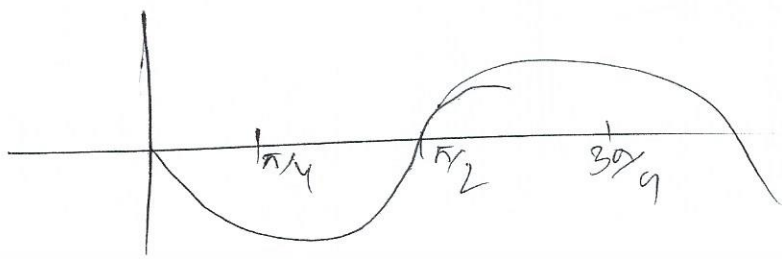
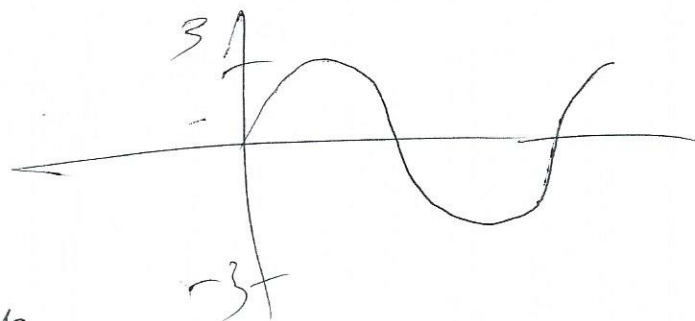
↳ vertical stretch

$$y = \sin(2x)$$

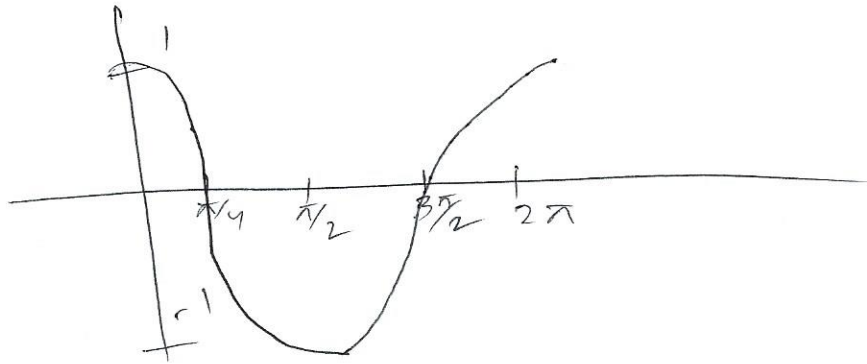
↳ reflect

across x-axis

↳ horizontal stretch by 2



$$y = \cos x \quad [0, 2\pi)$$



$$D: \mathbb{R}$$

$$R: [-1, 1]$$

$$\text{max: } 0, 2\pi, 4\pi \dots$$

$$\text{min: } \pi, \frac{3\pi}{2}$$

even  $f(x)$

Simultaneous graphs

Shifting  $\cos x$  to the right  $\pi/2$  units  
gives the graph on equation

$$y = \cos(x - \pi/2) = \sin x,$$

$$y = \sin(x + \pi/2) = \cos x,$$

