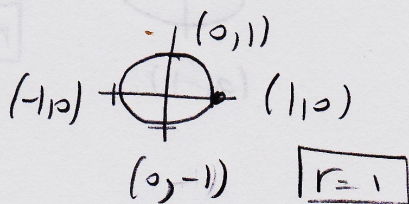


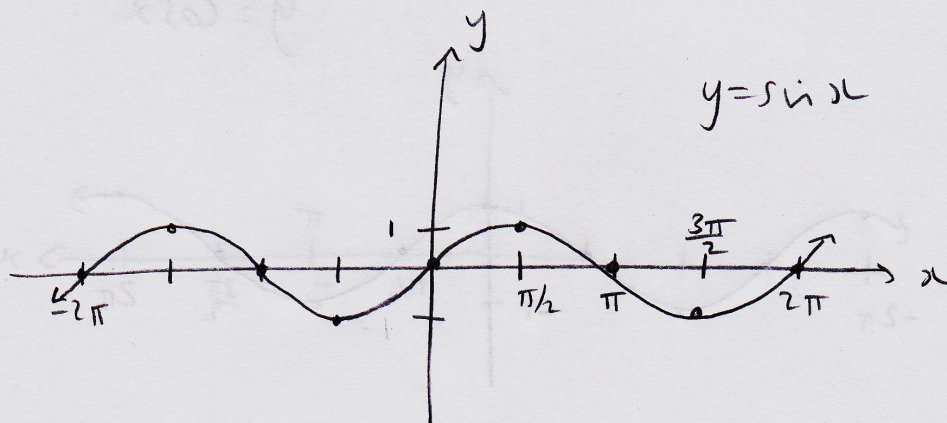
7.6 Graphs of Sine and Cosine Functions

p.1

$$\sin \theta = \frac{y}{r}$$



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



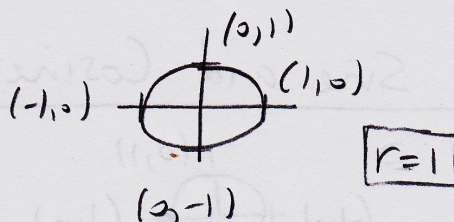
Properties of $y = \sin x$

odd function $\sin(-x) = -\sin x$

period = 2π

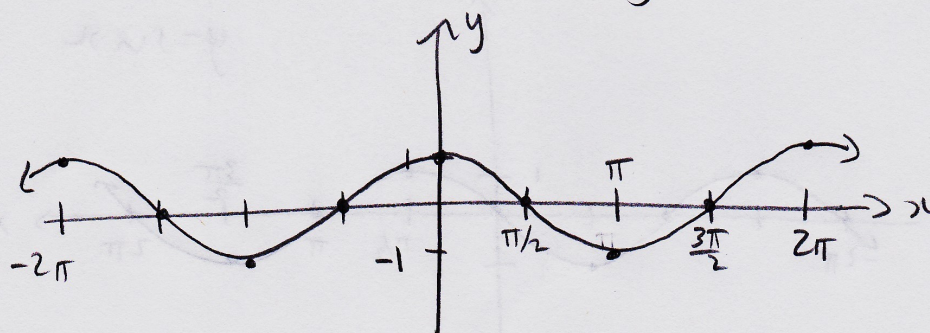
range: $-1 \leq y \leq 1$

$$\cos \theta = \frac{x}{r}$$



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

$$y = \cos x$$

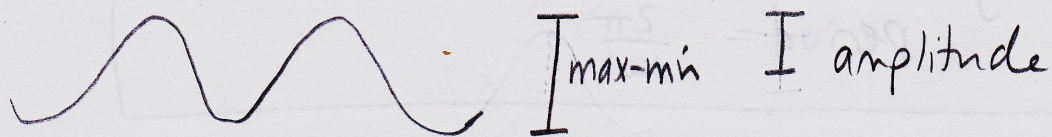


Properties of $y = \cos x$

even function $\cos(-x) = \cos x$

period = 2π

range : $-1 \leq y \leq 1$

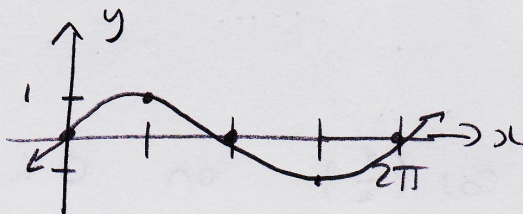


$$\text{amplitude} = \frac{1}{2}(\text{max} - \text{min})$$

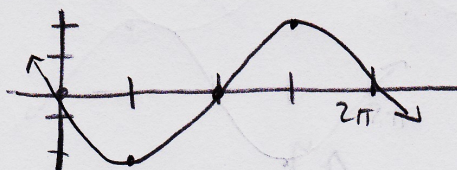
The amplitude of $y = \sin x$ and $y = \cos x$ is 1.

$$\frac{1}{2}[1 - (-1)] = 1 \quad \checkmark$$

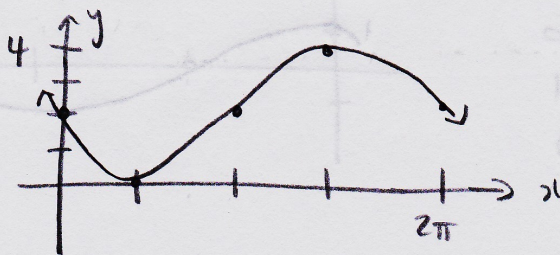
Ex: Graph $y = -2\sin x + 2$ on $0 \leq x \leq 2\pi$



$$y = \sin x$$



$$y = -2\sin x$$



$$y = -2\sin x + 2$$

$$\text{Period} = 2\pi \quad \text{Amplitude} = \frac{1}{2}[4 - 0] = 2$$

$$\text{Range} : 0 \leq y \leq 4$$

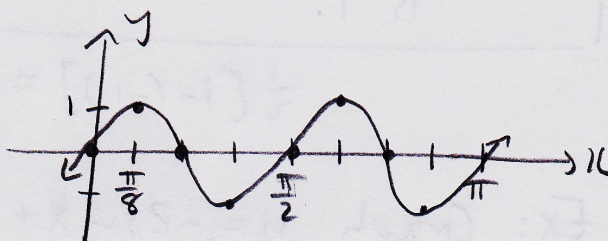
$y = \sin wx$ and $y = \cos wx$ have
period = $\frac{2\pi}{|w|}$

p. 4

Ex: Graph $y = \sin 4x$ on $0 \leq x \leq \pi$

Period = $\frac{2\pi}{4} = \pi/2$

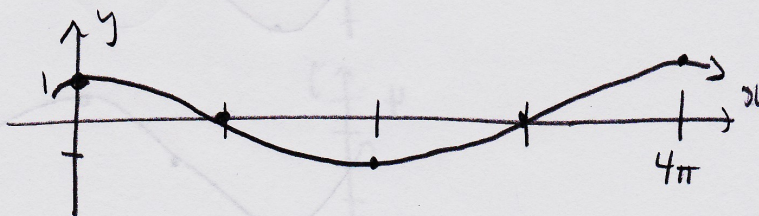
x	y
0	$\sin 0 = 0$
$\pi/8$	$\sin \frac{\pi}{2} = 1$
$\pi/4$	$\sin \pi = 0$
$3\pi/8$	-1
$\pi/2$	0



Ex: Graph $y = \cos(\frac{x}{2})$ on $0 \leq x \leq 4\pi$

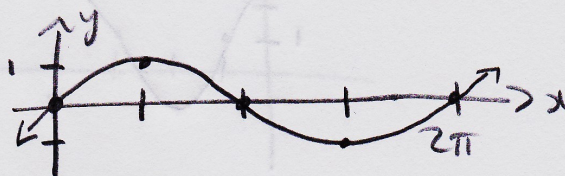
Period = $\frac{2\pi}{(1/2)} = 4\pi$

x	y
0	$\cos 0 = 1$
π	$\cos \frac{\pi}{2} = 0$
2π	-1
3π	0
4π	1



Ex: Graph $y = \cos(x - \frac{\pi}{2})$ on $0 \leq x \leq 2\pi$ p.5

x	y
0	$\cos(-\frac{\pi}{2}) = \cos \frac{\pi}{2} = 0$
$\pi/2$	$\cos 0 = 1$
π	0
$3\pi/2$	-1
2π	0



Notice $\cos(x - \frac{\pi}{2}) = \sin x$
(More details later)

Ex: Find amplitude and period of
 $y = 6\sin(5x) + 2$

range of $\sin \theta$: $-1 \leq y \leq 1$

$\sin(5x)$: $-1 \leq y \leq 1$

$6\sin(5x)$: $-6 \leq y \leq 6$

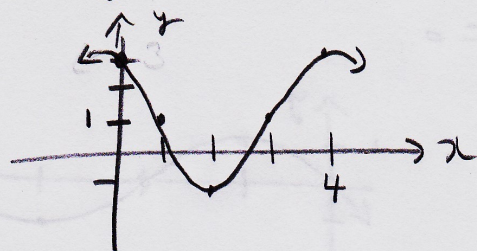
$6\sin(5x) + 2$: $-4 \leq y \leq 8$

amplitude = $\frac{1}{2}(8 - (-4)) = 6$

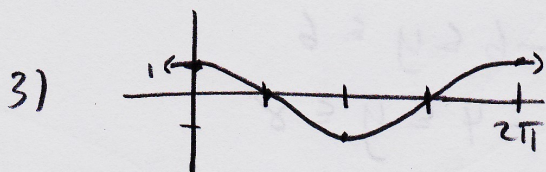
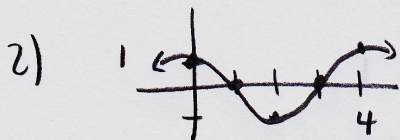
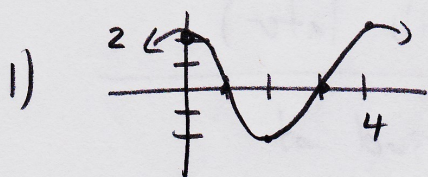
period = $\frac{2\pi}{5}$

$y = A\sin(\omega x) + C$ and $y = A\cos(\omega x) + C$
have amplitude = $|A|$ and period = $\frac{2\pi}{|\omega|}$

Ex: Write as $y = A \sin(\omega x) + c$ or $y = A \cos(\omega x) + c$ with $\omega > 0$



Work backwards to $y = \sin x$ or $y = \cos x$



3)

$$y = \cos x$$

2)

$$y = \cos \omega x$$

$$\text{period} = 4$$

$$\frac{2\pi}{\omega} = 4$$

$$(\omega > 0)$$

$$\omega = \pi/2$$

$$y = \cos\left(\frac{\pi}{2}x\right)$$

$$1) \quad y = A \cos\left(\frac{\pi}{2} x\right) + C$$

$$\boxed{y = 2 \cos\left(\frac{\pi}{2} x\right) + 1}$$

Original : $y = 2 \cos\left(\frac{\pi}{2} x\right) + C$

$$\boxed{y = 2 \cos\left(\frac{\pi}{2} x\right) + 1}$$