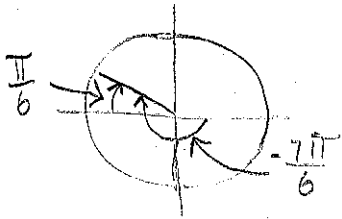


## 10-2 Functions of Related Values

1. a)  $\sin(-\frac{7\pi}{6})$

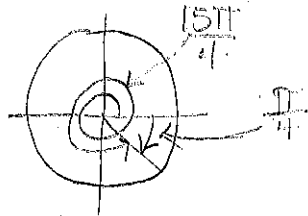


$\sin \frac{\pi}{6} = \frac{1}{2}$  and  $\sin$  is pos in

Q2 so  
 $\sin(-\frac{7\pi}{6}) = -\frac{1}{2}$

b)  $\cos(\frac{15\pi}{4})$

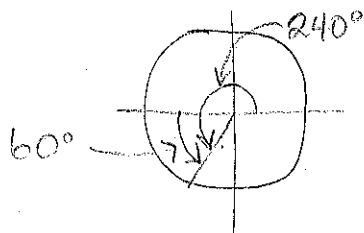
$\frac{15}{4} = 3\frac{3}{4}$



$\cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$  and  $\cos$  is pos in

Q4 so  
 $\cos \frac{15\pi}{4} = \frac{\sqrt{2}}{2}$

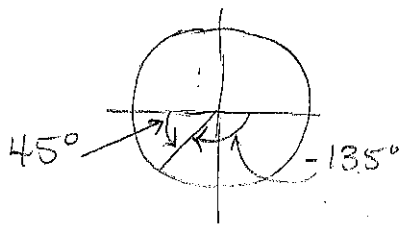
c)  $\sin 240^\circ$



$\sin 60^\circ = \frac{\sqrt{3}}{2}$  but  $\sin$  is neg in

Q3 so  
 $\sin 240^\circ = -\frac{\sqrt{3}}{2}$

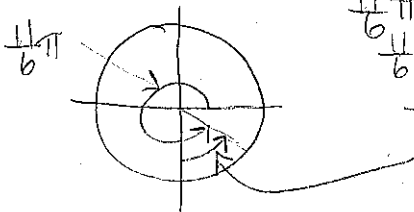
d)  $\cos(-135^\circ)$



$\cos 45^\circ = \frac{\sqrt{2}}{2}$  but  $\cos$  is neg in

Q2 so  
 $\cos(-135^\circ) = -\frac{\sqrt{2}}{2}$

2. a)  $\cos \frac{11}{6}\pi$



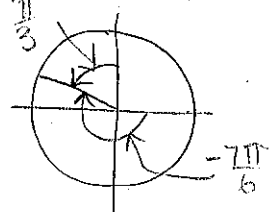
$$\begin{aligned} \frac{11}{6}\pi - \frac{3}{2}\pi &= \\ \frac{11}{6}\pi - \frac{9}{6}\pi &= \\ \frac{2}{6}\pi &= \\ \frac{1}{3}\pi & \end{aligned}$$

$$\begin{aligned} \cos \frac{11}{6}\pi &= \cos\left(\frac{3\pi}{2} + \frac{\pi}{3}\right) \\ &= \sin \frac{\pi}{3} \\ &= \frac{\sqrt{3}}{2} \end{aligned}$$

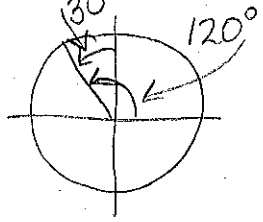
so  $\cos \frac{11}{6}\pi = \frac{\sqrt{3}}{2}$

10-2 cont.

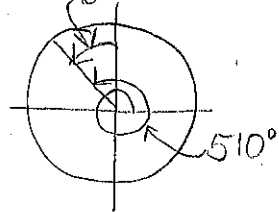
2. b)  $\sin(-\frac{7\pi}{6}) = -\sin \frac{7\pi}{6}$   
 $\frac{3\pi}{2} - \frac{7\pi}{6} = \frac{9\pi}{6} - \frac{7\pi}{6} = \frac{2\pi}{6} = \frac{\pi}{3}$   
 $-\sin(\frac{7\pi}{6}) = \sin(\frac{\pi}{2} + \frac{\pi}{3})$   
 $= \cos \frac{\pi}{3}$   
 $= \frac{1}{2}$



c)  $\sin 120^\circ = \sin(90^\circ + 30^\circ)$   
 $= \cos 30^\circ$   
 $= \frac{\sqrt{3}}{2}$



d)  $\tan 510^\circ = \tan(90^\circ + 60^\circ)$   
 $= -\cot 60^\circ$   
 $= -\frac{\sqrt{3}}{3}$



510  
360  
150

3. a)  $\cos x + \cos(\pi - x) - \cos(\pi + x) - \cos(-x)$   
 $\cos x - \cos x + \cos x - \cos x$   
 $0$

b)  $\tan x + \tan(\pi - x) + \cot(\frac{\pi}{2} - x) - \tan(2\pi - x)$   
 $\tan x - \tan x + \frac{1}{\tan(\frac{\pi}{2} - x)} + \tan x$   
 $\frac{1}{\cot x} + \tan x$   
 $\frac{1}{\tan x} + \tan x$   
 $\tan x + \tan x$   
 $2 \tan x$

10-2 cont.

$$3. c) \sin(\pi+x) + \cos\left(\frac{\pi}{2}-x\right) + \tan\left(\frac{\pi}{2}+x\right) + \tan\left(\frac{3\pi}{2}-x\right)$$
$$-\sin x + \sin x - \cot x + \cot x$$

0

$$d) \sin\left(\frac{\pi}{2}+x\right) - \cos\left(\frac{3\pi}{2}-x\right) + \sin\left(\frac{3\pi}{2}-x\right)$$
$$\cos x + \sin x - \cos x$$

$\sin x$

$$e) \sin\left(\frac{\pi}{2}-x\right) + \sin(\pi-x) + \sin\left(\frac{3\pi}{2}-x\right) + \sin(2\pi-x)$$
$$\cos x + \sin x - \cos x - \sin x$$

0

4. a)  $\pi-x$

$$\csc(\pi-x) = \frac{1}{\sin(\pi-x)} = \frac{1}{\sin x} = \csc x$$

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

$$\cot(\pi-x) = \frac{1}{\tan(\pi-x)} = \frac{-1}{\tan x} = -\cot x$$

b)  $\frac{\pi}{2}+x$

$$\csc\left(\frac{\pi}{2}+x\right) = \frac{1}{\sin\left(\frac{\pi}{2}+x\right)} = \frac{1}{\cos x} = \sec x$$

$$\sec\left(\frac{\pi}{2}+x\right) = \frac{1}{\cos\left(\frac{\pi}{2}+x\right)} = \frac{-1}{\sin x} = -\csc x$$

$$\cot\left(\frac{\pi}{2}+x\right) = \frac{1}{\tan\left(\frac{\pi}{2}+x\right)} = \frac{-1}{\cot x} = -\tan x$$

$$5. a) \sin(x-\pi)$$
$$\sin[-(\pi-x)]$$
$$-\sin(\pi-x)$$
$$-\sin x$$

$$b) \cos\left(x-\frac{\pi}{2}\right)$$
$$\cos\left[-\left(\frac{\pi}{2}-x\right)\right]$$
$$\cos\left(\frac{\pi}{2}-x\right)$$
$$\sin x$$

$$c) \tan(-x-\pi)$$
$$\tan[-(\pi+x)]$$
$$-\tan(\pi+x)$$
$$-\tan x$$

10-2 cont.  
b. a)  $\sec\left(\pi + \frac{\pi}{3}\right)$

$$\frac{1}{\cos\left(\pi + \frac{\pi}{3}\right)}$$

$$\frac{1}{-\cos\frac{\pi}{3}}$$

$$\frac{1}{-\frac{1}{2}}$$

$$-2$$

b)  $\csc\left(\frac{3\pi}{2} - \frac{\pi}{6}\right)$

$$\frac{1}{\sin\left(\frac{3\pi}{2} - \frac{\pi}{6}\right)}$$

$$\frac{1}{-\cos\frac{\pi}{6}}$$

$$\frac{1}{-\frac{\sqrt{3}}{2}}$$

$$-\frac{2}{\sqrt{3}}$$

c)  $\cot\left(\frac{\pi}{2} + \frac{\pi}{3}\right)$

$$\frac{1}{\tan\left(\frac{\pi}{2} + \frac{\pi}{3}\right)}$$

$$\frac{1}{-\cot\frac{\pi}{3}}$$

$$\frac{1}{-\frac{\sqrt{3}}{3}}$$

$$-\frac{3}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{-3\sqrt{3}}{\sqrt{3}} = -\sqrt{3}$$

7. a)  $\frac{\cos(\pi+x)\cos\left(\frac{\pi}{2}+x\right)}{\cos(\pi-x)} - \frac{\sin\left(\frac{3\pi}{2}-x\right)}{\sec(\pi+x)}$

$$\frac{-\cos x(-\sin x)}{(-\cos x)} - \frac{(-\cos x)}{\cos(\pi+x)}$$

$$-\sin x + \frac{\cos x}{-\cos x}$$

$$-\sin x - \cos^2 x$$