TEXTBOOK EXERCISES 3.2

1. $\cos x = \frac{-1}{2}$

We have, $\sin^2 x = 1 - \cos^2 x = 1 - \frac{1}{4} = \frac{3}{4}$

$\Rightarrow \sin x = \pm\sqrt{\frac{3}{4}} = \pm\frac{\sqrt{3}}{2}$

Since x is in IIIrd quadrant, sinx is negative.

$\therefore \sin x = \frac{-\sqrt{3}}{2}$ $\therefore \tan x = \frac{\sin x}{\cos x} = \frac{\frac{-\sqrt{3}}{2}}{\frac{-1}{2}} = \sqrt{3}$,

$\text{cosec} x \frac{1}{\sin x} = \frac{-2}{\sqrt{3}}$,

$\sec x = \frac{1}{\cos x} = -2$, $\cot x = \frac{1}{\tan x} = \frac{1}{\sqrt{3}}$.

2. $\sin x = \frac{3}{5}$, x is in IInd quadrant.

$\therefore \cos^2 x = 1 - \sin^2 x = 1 - \frac{9}{25} = \frac{16}{25}$

$\Rightarrow \cos x = \pm\frac{4}{5}$

Since x is in IInd quadrant, cosx is negative.

$\therefore \cos x = \frac{-4}{5}$

$\tan x = \frac{-3}{4}$, $\text{cosec} x = \frac{5}{3}$, $\sec x = \frac{-5}{4}$, $\cot x = \frac{-4}{3}$.

3. $\cot x = \frac{3}{4}$, x lies in third quadrant.

We have, $\text{cosec}^2 x - 1 = \cot^2 x$

$\therefore \text{cosec}^2 x = 1 + \frac{9}{16} = \frac{25}{16} \Rightarrow \text{cosec} x = \pm\frac{5}{4}$

$\text{cosec} x = \frac{-5}{4}$; since x is in third quadrant.

$\therefore \sin x = \frac{-4}{5}$

$\cos x = \cot x \cdot \sin x = \frac{3}{4} \cdot \frac{-4}{5} = \frac{-3}{5}$,

$\sec x = \frac{-5}{3}$, $\tan x = \frac{4}{3}$

4. $\sec x = \frac{13}{5}$, x is in IVth quadrant.

$\therefore 1 + \tan^2 x = \sec^2 x \Rightarrow \tan^2 x = \sec^2 x - 1$

$\Rightarrow \tan^2 x = \frac{169}{25} - 1 = \frac{144}{25}$

$\therefore \tan x = \pm\frac{12}{5}$

But $\tan x = \frac{-12}{5}$, since x is in the IVth quadrant.

$\sec x = \frac{13}{5} \Rightarrow \cos x = \frac{5}{13}$

$\sin x = \tan x \cdot \cos x = \frac{-12}{5} \cdot \frac{5}{13} = \frac{-12}{13}$

$\text{cosec} x = \frac{-13}{12}$, $\cot x = \frac{-5}{12}$

5. $\tan x = \frac{-5}{12}$, x is in IInd quadrant.

$\therefore \sec^2 x = 1 + \tan^2 x = 1 + \frac{25}{144} = \frac{169}{144}$

$\Rightarrow \sec x = \pm\frac{13}{12}$

But $\sec x = \frac{-13}{12}$, since x is in IInd quadrant.

$\therefore \cos x = \frac{-12}{13}$

$\sin x = \tan x \cos x = \frac{-5}{12} \times \frac{-12}{13} = \frac{5}{13}$

$\text{cosec} x = \frac{13}{5}$, $\cot x = \frac{-12}{5}$

6. $\sin 765^\circ = \sin(2 \times 360^\circ + 45^\circ) = \sin(4\pi + 45^\circ)$

$= \sin 45^\circ = \frac{1}{\sqrt{2}}$.

7. $\text{cosec}(-1410^\circ) = -\text{cosec}(1410^\circ)$

$(\because \text{cosec}(-\theta) = -\text{cosec}\,\theta)$

$= -\operatorname{cosec}(3 \times 360^\circ + 330^\circ) = -\operatorname{cosec}(6\pi + 330^\circ)$

$= -\operatorname{cosec}330^\circ = -\operatorname{cosec}(360^\circ - 30^\circ)$

$= -(-\operatorname{cosec}30^\circ) = \operatorname{cosec}30^\circ = 2.$

8. $\tan\left(\frac{19\pi}{3}\right) = \tan\left(6\pi + \frac{\pi}{3}\right) = \tan\frac{\pi}{3} = \sqrt{3}$.

9. $\sin\left(\frac{-11\pi}{3}\right) = -\sin\left(\frac{11\pi}{3}\right) = -\sin\left(2\pi + \frac{5\pi}{3}\right)$

$= -\sin\left(\frac{5\pi}{3}\right) = -\sin\left(2\pi - \frac{\pi}{3}\right)$

$= -\left(-\sin\frac{\pi}{3}\right) = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$.

10. $\cot\left(\frac{-15\pi}{4}\right) = -\cot\left(\frac{15\pi}{4}\right) = -\cot\left(2\pi + \frac{7\pi}{4}\right)$

$= -\cot\left(\frac{7\pi}{4}\right) = -\cot\left(\pi + \frac{3\pi}{4}\right)$

$= -\cot\frac{3\pi}{4} = -\cot\left(\pi - \frac{\pi}{4}\right) = -\left(-\cot\frac{\pi}{4}\right) = \cot\frac{\pi}{4} = 1$

Formula for $(\frac{\pi}{2} - x)$	Formula for $(\frac{\pi}{2} + x)$
1. $\sin(\frac{\pi}{2} - x) = \cos x$	1. $\sin(\frac{\pi}{2} + x) = \cos x$
2. $\cos(\frac{\pi}{2} - x) = \sin x$	2. $\cos(\frac{\pi}{2} + x) = -\sin x$
3. $\tan(\frac{\pi}{2} - x) = \cot x$	3. $\tan(\frac{\pi}{2} + x) = -\cot x$
4. $\operatorname{cosec}(\frac{\pi}{2} - x) = \sec x$	4. $\operatorname{cosec}(\frac{\pi}{2} + x) = \sec x$
5. $\sec(\frac{\pi}{2} - x) = \operatorname{cosec} x$	5. $\sec(\frac{\pi}{2} + x) = -\operatorname{cosec} x$
6. $\cot(\frac{\pi}{2} - x) = \tan x$	6. $\cot(\frac{\pi}{2} + x) = -\tan x$

Formula for $(\pi - x)$	Formula for $(\pi + x)$
1. $\sin(\pi - x) = \sin x$	1. $\sin(\pi + x) = -\sin x$
2. $\cos(\pi - x) = -\cos x$	2. $\cos(\pi + x) = -\cos x$
3. $\tan(\pi - x) = -\tan x$	3. $\tan(\pi + x) = \tan x$
4. $\operatorname{cosec}(\pi - x) = \operatorname{cosec} x$	4. $\operatorname{cosec}(\pi + x) = -\operatorname{cosec} x$
5. $\sec(\pi - x) = -\sec x$	5. $\sec(\pi + x) = -\sec x$
6. $\cot(\pi - x) = -\cot x$	6. $\cot(\pi + x) = \cot x$

Formula for $(\frac{3\pi}{2} - x)$	Formula for $(\frac{3\pi}{2} + x)$
1. $\sin(\frac{3\pi}{2} - x) = -\cos x$	1. $\sin(\frac{3\pi}{2} + x) = -\cos x$
2. $\cos(\frac{3\pi}{2} - x) = -\sin x$	2. $\cos(\frac{3\pi}{2} + x) = \sin x$
3. $\tan(\frac{3\pi}{2} - x) = \cot x$	3. $\tan(\frac{3\pi}{2} + x) = -\cot x$
4. $\operatorname{cosec}(\frac{3\pi}{2} - x) = -\sec x$	4. $\operatorname{cosec}(\frac{3\pi}{2} + x) = -\sec x$
5. $\sec(\frac{3\pi}{2} - x) = -\operatorname{cosec} x$	5. $\sec(\frac{3\pi}{2} + x) = \operatorname{cosec} x$
6. $\cot(\frac{3\pi}{2} - x) = \tan x$	6. $\cot(\frac{3\pi}{2} + x) = -\cot x$

Formula for $(2\pi - x)$	Formula for $(2\pi + x)$
1. $\sin(2\pi - x) = -\sin x$	1. $\sin(2\pi + x) = \sin x$
2. $\cos(2\pi - x) = \cos x$	2. $\cos(2\pi + x) = \cos x$
3. $\tan(2\pi - x) = -\tan x$	3. $\tan(2\pi + x) = \tan x$
4. $\operatorname{cosec}(2\pi - x) = -\operatorname{cosec} x$	4. $\operatorname{cosec}(2\pi + x) = \operatorname{cosec} x$
5. $\sec(2\pi - x) = \sec x$	5. $\sec(2\pi + x) = \sec x$
6. $\cot(2\pi - x) = -\cot x$	6. $\cot(2\pi + x) = \cot x$

Sign of Trignometric functions

$\sin(-\theta) = -\sin\theta$

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

$\tan(-\theta) = -\tan\theta$