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6.3 Using Secn, Cosecn and Cotn

1a] $\cos n = \frac{1}{4} \Rightarrow \sec n = 4$

b] $\frac{3}{\sin n} = 5 \Rightarrow \frac{3}{5} = \sin n \Rightarrow \operatorname{cosec} n = \frac{5}{3}$

c] $2\cos n = 3\sin n$

$\frac{\cos n}{\sin n} = \frac{3}{2} \Rightarrow \cot n = \frac{3}{2}$

2a] $\cos n \cot n + \sin n$

$\cos n \times \frac{\cos n}{\sin n} + \sin n$

$\frac{\cos^2 n}{\sin n} + \sin n$

$\frac{\cos^2 n + \sin^2 n}{\sin n}$ Using $\sin^2 n + \cos^2 n \equiv 1$

$\frac{1}{\sin n} \Rightarrow \operatorname{cosec} n$

b] $\frac{1}{\cos n \tan n} \Rightarrow \frac{1}{\cos n \times \frac{\sin n}{\cos n}}$

$\Rightarrow \frac{1}{\sin n} \Rightarrow \operatorname{cosec} n$

c] $\cot 3n \sec 3n$

$= \frac{\cos 3n}{\sin 3n} \times \frac{1}{\cos 3n} \Rightarrow \frac{1}{\sin 3n} \Rightarrow \operatorname{cosec} 3n$

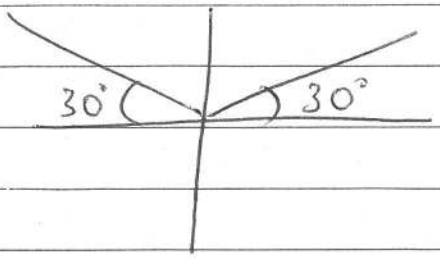
6.3 Using Secn, Cosecn and Cotn

3a] $0 \leq n \leq 360$

$\text{Cosec}\, n = 2$

$\frac{1}{\sin n} = 2$

$\sin n = \frac{1}{2}$

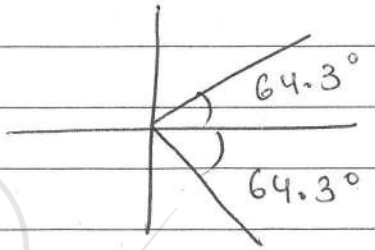


$n = 30°, 150°$

b] $\sqrt{3}\,\text{Sec}\, n = 4$

$\text{Sec}\, n = \frac{4}{\sqrt{3}}$

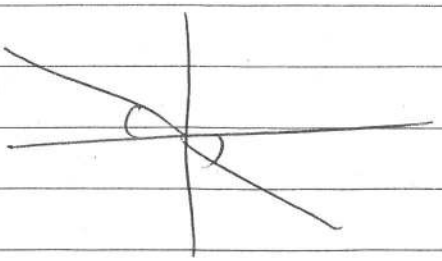
$\text{Cos}\, n = \frac{\sqrt{3}}{4}$



$n = 64.3°, 296°$

c] $3\,\text{Cot}\, n = -2.5$

$\text{Cot}\, n = -\frac{2.5}{3}$



$\tan n = \frac{-3}{2.5} \Longrightarrow n = -50.19$

$n = 130°, 310°$

4a] $= \frac{\text{Cot}\, n + \tan n}{\text{Sec}\, n}$

$= \frac{\frac{1}{\tan n} + \tan n}{\text{Sec}\, n}$

$= \frac{1 + \tan^2 n}{\tan n} \times \frac{1}{\text{Sec}\, n}$

$= \frac{\text{Sec}^2 n}{\tan n} \times \frac{1}{\text{Sec}\, n}$

6.3 Using Secx, Cosecx and Cotx

4a] Cont.

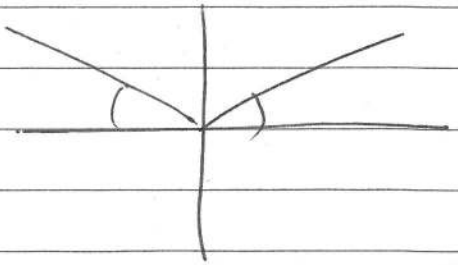
$= \frac{Secx}{tanx}$

$= \frac{\frac{1}{Cosx}}{\frac{Sinx}{Cosx}} \Rightarrow \frac{1}{Sinx} \Longrightarrow Cosecx$

Hence, proved.

b] $Cosecx = 4$

$Sinx = \frac{1}{4}$



$x = 14.5°, 166°$

5a] ~~Cos~~ $Cos3\theta + Sin3\theta tan3\theta$

$Cos3\theta + Sin3\theta \times \frac{Sin3\theta}{Cos3\theta}$

$Cos3\theta + \frac{Sin^2 3\theta}{Cos3\theta}$

$\frac{Cos^2 3\theta + Sin^2 3\theta}{Cos3\theta}$ Using $Sin^2\theta + Cos^2\theta = 1$

$\frac{1}{Cos3\theta} \Longrightarrow Sec3\theta$

Hence proved.

b] $2Cos3\theta + 2Sin3\theta tan3\theta = -1$

$2(Cos3\theta + Sin3\theta tan3\theta) = -1$

$2(Sec3\theta) = -1$

$Sec3\theta = \frac{-1}{2}$

$Sec3\theta K$ has no solutions in the range $-1 < K < 1$

6.3 Using Secn, Cosecn and Cotn

6] $3\sin x = 8\cot x$

$3\sin x = 8\left(\frac{\cos x}{\sin x}\right)$ $\quad 0 \leq x \leq 2\pi$

$3\sin^2 x = 8\cos x$

$3(1-\cos^2 x) = 8\cos x$

$3 - 3\cos^2 x = 8\cos x$

$3\cos^2 x + 8\cos x - 3 = 0$

$\cos x = \frac{1}{3}$ $\qquad$ $\cos x = -3$ ✗

$x = 1.23°, 5.05°$

7a] $\frac{\sin x}{1+\cos x} + \frac{1+\cos x}{\sin x}$

$= \frac{\sin^2 x + (1+\cos x)(1+\cos x)}{\sin x + \cos x \sin x}$

$= \frac{\sin^2 x + 1 + 2\cos x + \cos^2 x}{\sin x + \sin x \cos x}$

Using $\sin^2 x + \cos^2 x = 1$

$= \frac{1+1+2\cos x}{\sin x + \sin x \cos x}$

$= \frac{2+2\cos x}{\sin x + \sin x \cos x}$

$= \frac{2(1+\cos x)}{\sin x(1+\cos x)}$

$= \frac{2}{\sin x}$

$= 2\operatorname{cosec} x$

Hence proved.

6.3 Using Secx, Cosecx and Cotx

7b] $2\,\text{Cosec}\left(x - \frac{\pi}{6}\right) = 5$

$= \text{Cosec}\left(x - \frac{\pi}{6}\right) = \frac{5}{2}$

$= \sin\left(x - \frac{\pi}{6}\right) = \frac{2}{5}$

$x - \frac{\pi}{6} = 0.41°, 2.73°$

$x = 0.934°, 3.25°$