

P. 376

(43)

$$2 \sin x + \csc x = 0$$

$$\frac{2 \sin^2 x}{\sin x} + \frac{1}{\sin x} = 0$$

$$\frac{2 \sin^2 x + 1}{\sin x} = 0$$

$$2 \sin^2 x + 1 = 0$$

$$\begin{aligned} \sin^2 x &= -\frac{1}{2} \\ \sin x &= \pm \sqrt{-\frac{1}{2}} \\ \text{No Solution} \end{aligned}$$

5-4 Notes on Sum and Difference Formulas

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Ex. 1 Find the exact values.

$$\begin{aligned} \sin 15^\circ &= \sin(45^\circ - 30^\circ) \\ &= \sin U \cos V - \cos U \sin V \\ &= \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ \\ &= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2} \\ &= \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} = \boxed{\frac{\sqrt{6} - \sqrt{2}}{4}} \end{aligned}$$

$$\begin{aligned} \cos 15^\circ &= \cos U \cos V + \sin U \sin V \\ &= \cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ \\ &= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} \\ &= \frac{\sqrt{6} + \sqrt{2}}{4} \end{aligned}$$

$\tan 15^\circ$

$$\tan(45^\circ - 30^\circ) = \frac{\tan U - \tan V}{1 + \tan U \tan V}$$

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

$$\frac{\frac{3-\sqrt{3}}{\sqrt{3}}}{\frac{3+\sqrt{3}}{\sqrt{3}}} = \frac{(3-\sqrt{3})(3-\sqrt{3})}{(3+\sqrt{3})(3-\sqrt{3})} = \frac{9-6\sqrt{3}+3}{9-3}$$

$$\frac{12-6\sqrt{3}}{6} = \boxed{2-\sqrt{3}}$$

Ex. 2 Find the exact values. Hint: $\frac{5\pi}{12} = \frac{3\pi}{4} - \frac{\pi}{3}$

$$\sin \frac{5\pi}{12} \quad \sin \left(\underbrace{\frac{3\pi}{4}}_u - \underbrace{\frac{\pi}{3}}_v \right) = \sin \frac{3\pi}{4} \cdot \cos \frac{\pi}{3} - \cos \frac{3\pi}{4} \sin \frac{\pi}{3}$$
$$\frac{\sqrt{2} + \sqrt{6}}{4}$$

$$\cos \frac{5\pi}{12} \quad \cos \left(\underbrace{\frac{3\pi}{4}}_u - \underbrace{\frac{\pi}{3}}_v \right) = \cos \frac{3\pi}{4} \cos \frac{\pi}{3} + \sin \frac{3\pi}{4} \sin \frac{\pi}{3}$$
$$\frac{-\sqrt{2} + \sqrt{6}}{4}$$

$$\tan \frac{5\pi}{12}$$

Homework
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#1-21 odds