

## Solutions

$$1a) \sin^2 x + \cos^2 x = 1$$

$$1 + \tan^2 x = \sec^2 x$$

$$1 + \cot^2 x = \csc^2 x$$

$$1b) \sec x$$

$$1c) -\cos^4 x$$

$$1d) -\cos(8^\circ)$$

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

$$1f) \sin \theta = \frac{7\sqrt{53}}{53}$$

$$1g) \cot \theta = \frac{\sqrt{5}}{2}$$

|                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\tan x + \frac{\cos x}{1 + \sin x} = \sec x$ $\frac{\sin x}{\cos x} + \frac{\cos x}{1 + \sin x}$ $\frac{\sin x(1 + \sin x) + \cos x(\cos x)}{\cos x(1 + \sin x)}$ $2a) \frac{\sin x + \sin^2 x + \cos^2 x}{\cos x(1 + \sin x)}$ $\frac{1 + \sin x}{\cos x(1 + \sin x)}$ $\frac{1}{\cos x}$ $\sec x$ | $\frac{\csc x}{\cot x + \tan x} = \cos x$ $\frac{1}{\frac{\sin x}{\cos x} + \frac{\sin x}{\cos x}}$ $\frac{1}{\frac{\sin x}{\cos^2 x + \sin^2 x}}$ $\frac{1}{\sin x \cos x}$ $2b) \frac{1}{\sin x \cos x}$ $\frac{1}{\sin x} \cdot \frac{\sin x \cos x}{1}$ $\cos x$ |
| $2c) \csc x = 2$                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                      |

3a)  $\cos(375^\circ) = \cos(15^\circ) = \cos(45 - 30) = \cos 45 \cos 30 + \sin 45 \sin 30 = \frac{\sqrt{2}}{2} \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}$

3b)  $\cos\left(\frac{5\pi}{12}\right) = \cos(75^\circ) = \cos(45 + 30) = \cos 45 \cos 30 - \sin 45 \sin 30 = \frac{\sqrt{2}}{2} \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \frac{1}{2} = \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4} = \frac{\sqrt{6} - \sqrt{2}}{4}$

3c)  $\sin(-165^\circ) = \sin(195^\circ) = \sin(135 + 60) = \sin 135 \cos 60 + \cos 135 \sin 60 = \frac{-\sqrt{2}}{2} \frac{1}{2} + \frac{\sqrt{2}}{2} \frac{\sqrt{3}}{2} = \frac{-\sqrt{2} + \sqrt{6}}{4}$

3d)  $\tan(345^\circ) = \tan(300 + 45) = \frac{\tan 300 + \tan 45}{1 - \tan 300 \tan 45} = \frac{-\sqrt{3} + 1}{1 - (-\sqrt{3} \cdot 1)} = \frac{(-\sqrt{3} + 1) \cdot (1 - \sqrt{3})}{1 + \sqrt{3} \cdot (1 - \sqrt{3})} = \frac{-\sqrt{3} + 3 + 1 - \sqrt{3}}{1 - 3} = \frac{-2\sqrt{3} + 4}{-2} = \sqrt{3} - 2$

$$3e) \frac{153}{185} \quad 3f) \frac{-16}{63}$$

$$4a) \frac{2\sqrt{15}}{16} \quad 4b) \frac{4}{5}, \frac{3}{5}, \frac{4}{3} \quad 4c) + \frac{\sqrt{2+\sqrt{3}}}{2} \quad 4d) - \frac{\sqrt{2-\sqrt{2}}}{2} \quad 4e)$$

$$5a) \quad 5b) 0^\circ \quad 5c) 45^\circ \quad 5d) 0^\circ, 225^\circ \quad 5e) 30^\circ + 360^\circ k, 150^\circ + 360^\circ k$$

$$5f) 0^\circ + 360^\circ k, 45^\circ + 360^\circ k, 180^\circ + 360^\circ k, 225^\circ + 360^\circ k \text{ or...even better...} 0^\circ + 360^\circ k, 45^\circ + 360^\circ k$$