19. $\tan 22.5° = \tan \frac{45°}{2} = \sqrt{\frac{1 - \cos 45°}{1 + \cos 45°}}$

$= \sqrt{\frac{1 - \frac{\sqrt{2}}{2}}{1 + \frac{\sqrt{2}}{2}}} = \sqrt{\frac{\frac{2-\sqrt{2}}{2}}{\frac{2+\sqrt{2}}{2}}} \Rightarrow \frac{2-\sqrt{2}}{\cancel{2}} \cdot \frac{\cancel{2}}{2+\sqrt{2}}$

$= \sqrt{\frac{2-\sqrt{2}}{2+\sqrt{2}} \cdot \frac{2-\sqrt{2}}{2-\sqrt{2}}} = \sqrt{\frac{4-2\sqrt{2}-2\sqrt{2}+2}{4-2}} = \sqrt{\frac{6-4\sqrt{2}}{2}}$

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

$\sqrt{\frac{(2-\sqrt{2})^2}{4-2}} = \frac{\sqrt{(2-\sqrt{2})^2}}{\sqrt{2}} = \frac{2-\sqrt{2}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

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

30. $(\sin\theta + \cos\theta)^2 - 1 = \sin 2\theta$

$(\sin\theta + \cos\theta)(\sin\theta + \cos\theta)$

$\sin^2\theta + 2\sin\theta\cos\theta + \cos^2\theta - 1 =$

$1 + 2\sin\theta\cos\theta - 1 =$

$2\sin\theta\cos\theta = 2\sin\theta\cos\theta$

28. $\csc 2\theta = \frac{1}{2}\sec\theta\csc\theta$

$$\frac{1}{\sin 2\theta} = \frac{1}{2}\cdot\frac{1}{\cos\theta}\cdot\frac{1}{\sin\theta}$$

$$\frac{1}{2\sin\theta\cos\theta} = \frac{1}{2\sin\theta\cos\theta}$$

32. $\sec 2\theta = \frac{\cos^2\theta + \sin^2\theta}{\cos^2\theta - \sin^2\theta}$

$$\frac{1}{\cos 2\theta} = \frac{1}{\cos^2\theta - \sin^2\theta}$$

$$\frac{1}{\cos^2\theta - \sin^2\theta} = \frac{1}{\cos^2\theta - \sin^2\theta}$$

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

$x = 30^\circ, 150^\circ$

60° ref.

$\tan \theta = -\sqrt{3}$

$\theta = 120^\circ, 300^\circ$