

Mathematics 1613: Trigonometry Quiz #13

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

39: Evaluate $\tan \frac{7\pi}{12}$.

$$\tan\left(\frac{3\pi}{12} + \frac{4\pi}{12}\right) = \tan\left(\frac{\pi}{4} + \frac{\pi}{3}\right) = \frac{\sin\left(\frac{\pi}{4} + \frac{\pi}{3}\right)}{\cos\left(\frac{\pi}{4} + \frac{\pi}{3}\right)} = \frac{\sin \frac{\pi}{4} \cos \frac{\pi}{3} + \cos \frac{\pi}{4} \sin \frac{\pi}{3}}{\cos \frac{\pi}{4} \cos \frac{\pi}{3} - \sin \frac{\pi}{4} \sin \frac{\pi}{3}} = \frac{\frac{\sqrt{2}}{2} \cdot \frac{1}{2} + \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}}{\frac{\sqrt{2}}{2} \cdot \frac{1}{2} - \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}} = \frac{\sqrt{2} + \sqrt{6}}{\sqrt{2} - \sqrt{6}}$$

40: Use the above formulas to find expressions for the following:

$$\sin(2\theta) = \sin(\theta + \theta) = \sin \theta \cos \theta + \cos \theta \sin \theta = 2(\sin \theta \cos \theta)$$

$$\tan(\theta + \pi) = \frac{\sin(\theta + \pi)}{\cos(\theta + \pi)} = \frac{\sin \theta \cos \pi + \cos \theta \sin \pi}{\cos \theta \cos \pi - \sin \theta \sin \pi} = \frac{-\sin \theta + 0}{-\cos \theta - 0} = \tan \theta$$

$$\cos(\theta + 2\pi) = \cos \theta \cos 2\pi - \sin \theta \sin 2\pi = \cos \theta \cdot 1 - \sin \theta \cdot 0 = \cos \theta$$