

5.5

- Double Angle Formulas

$$\text{Verify } \sin(2\theta) = 2\sin\theta\cos\theta$$

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

$$\sin\theta\cos\theta + \cos\theta\sin\theta =$$

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

Verify

$$\cos(2\theta) = \cos^2\theta - \sin^2\theta$$

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

$$\cos\theta\cos\theta - \sin\theta\sin\theta =$$

$$\cos^2\theta - \sin^2\theta = \cos^2\theta - \sin^2\theta \checkmark$$

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

$$\cos^2\theta - (1 - \cos^2\theta)$$

$$2\cos^2\theta - 1$$

Verify: $\tan(2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}$

$$\tan(\theta + \theta) =$$

$$\frac{\tan\theta + \tan\theta}{1 - \tan\theta \tan\theta} =$$

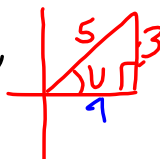
$$\frac{2\tan\theta}{1 - \tan^2\theta} = \frac{2\tan\theta}{1 - \tan^2\theta} \checkmark$$

#2

$$\frac{2\tan^{15^\circ}}{1 - \tan^2 15^\circ} = \tan(2(15^\circ))$$
$$= \tan 30^\circ$$

$$\frac{\sqrt{3}}{3}$$

$$\#3 \quad \sin u = \frac{3}{5}, \quad 0 < u < \frac{\pi}{2}$$

$$\sin 2u = 2 \sin u \cos u$$


$$= 2 \left(\frac{3}{5}\right) \left(\frac{4}{5}\right)$$

$$\sin 2u = \frac{24}{25}$$

$$\begin{aligned} \cos 2u &= \cos^2 u - \sin^2 u \\ &= \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2 \\ &= \frac{16}{25} - \frac{9}{25} \end{aligned}$$

$$\cos 2u = \frac{7}{25}$$

$$\begin{aligned} \tan 2u &= \frac{2 \tan u}{1 - \tan^2 u} = \frac{2 \left(\frac{3}{4}\right)}{1 - \left(\frac{3}{4}\right)^2} \\ &= \frac{3/2}{1 - 9/16} = \frac{3/2}{7/16} \end{aligned}$$

$$\frac{3}{2} \cdot \frac{16}{7} = \frac{24}{7}$$

$$\tan 2u = \frac{24}{7}$$