5.4 Multiple Angle Identities

Double Angle

$$\sin 2x = 2\sin x\cos x$$

$$\tan 2x = \frac{2\tan x}{1-\tan^2 x}$$

$$\begin{aligned}\cos 2x &= \cos^2 x - \sin^2 x\\ &= 2\cos^2 x - 1\\ &= 1 - 2\sin^2 x\end{aligned}$$

Power Reducing:

$$\cos^2 x = \frac{1+\cos 2x}{2}$$

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

$$\tan^2 x = \frac{1-\cos 2x}{1+\cos 2x}$$

Half Angle

$$\sin\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{2}}$$

$$\tan\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{1+\cos x}}$$

$$= \frac{1-\cos x}{\sin x}$$

$$\cos\frac{x}{2} = \pm\sqrt{\frac{1+\cos x}{2}}$$

$$= \frac{\sin x}{1+\cos x}$$

Use the half angle identities to find the exact value without a calculator

$$\sin 15^\circ$$

Prove: $\left(\sin x + \cos x\right)^2 = 1 + \sin 2x$

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

Solve the equation:

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

Use the power reducing formula to reduce:

$$\cos^4 x$$

Use the power reducing formula to reduce: