

§7.5 Double-Angle and Half –Angle Formulas

REMEMBER YOU KNOW ALGEBRA !

Double-Angle Identities	
$\sin 2\alpha = 2 \sin \alpha \cos \alpha$	$\tan 2\alpha = \frac{2 \tan \alpha}{1 - \tan^2 \alpha}$
$\begin{aligned}\cos 2\alpha &= \cos^2 \alpha - \sin^2 \alpha \\ &= 1 - 2 \sin^2 \alpha \\ &= 2 \cos^2 \alpha - 1\end{aligned}$	

Half-Angle Identities	
$\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$	$\tan \frac{\alpha}{2} = \frac{\sin \alpha}{1 + \cos \alpha} = \frac{1 - \cos \alpha}{\sin \alpha}$
$\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \cos \alpha}{2}}$	
Where the + or – sign is determined by the quadrant of the angle $\frac{\alpha}{2}$.	

Example 1 Evaluate. Find $\sin 2\theta$, $\cos 2\theta$, $\tan 2\theta$

$$\text{from } \sin \theta = \frac{3}{5}, \quad \frac{\pi}{2} < \theta < \pi$$

Example 2 Find the exact value. $\cos 15^\circ$

Example 3 If $\cos \alpha = \frac{-3}{5}$, $\pi < \alpha < \frac{3\pi}{2}$,

find the exact value of;

a) $\sin \frac{\alpha}{2}$

b) $\cos \frac{\alpha}{2}$

c) $\tan \frac{\alpha}{2}$