SEC 3.3 DOUBLE ANGLES / HALF-ANGLES

1. DOUBLE ANGLES

$\sin(\alpha+\beta)$

$\sin\alpha\cos\beta + \cos\alpha\sin\beta$ ← (set $\beta = \alpha$)

BUT $\sin(\alpha+\alpha) = \sin(2\alpha)$

$= 2\sin\alpha\cos\alpha$

$\cos(\alpha+\alpha) = \cos(2\alpha)$

$\cos\alpha\cos\alpha - \sin\alpha\sin\alpha$

$\cos^2\alpha - \sin^2\alpha$

$$\tan(2\alpha) = \frac{2\tan\alpha}{1-\tan^2\alpha}$$

DOUBLE ANGLE IDENTITIES

1) $\sin 2x = 2\sin x\cos x$

2) $\cos 2x = \cos^2 x - \sin^2 x$

$1 - 2\sin^2 x$

$2\cos^2 x - 1$

ALT. FORMS

$1 - \sin^2 x - \sin^2 x$

$\cos^2 x + (-1 + \cos^2 x)$

3) $\tan 2x = \dfrac{2\tan x}{1-\tan^2 x}$

2. HALF-ANGLES

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

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

3) $\tan\frac{x}{2} = \frac{\sin x}{1+\cos x} = \frac{1-\cos x}{\sin x}$