

$$(i) \sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$(ii) \cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$(iii) \tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$(iv) \cot(A \pm B) = \frac{\cot A \cot B \mp 1}{\cot B \pm \cot A}$$

$$(v) \tan\left(\frac{\pi}{4} \pm A\right) = \frac{1 \pm \tan A}{1 \mp \tan A}$$

$$(vi) \sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$$

$$(vii) \cos(A+B) \cos(A-B) = \cos^2 A - \sin^2 B \\ = \cos^2 B - \sin^2 A$$

$$(viii) \tan(A+B+C) = \frac{\tan A + \tan B + \tan C}{1 - \tan A \tan B - \tan B \tan C - \tan C \tan A}$$

$$(ix) \cot(A+B+C) = \frac{\cot A \cot B \cot C - \cot A - \cot B - \cot C}{\cot A \cot B + \cot B \cot C + \cot C \cot A - 1}$$

multiples angles $2A, 3A, 4A$

sub " " $\frac{A}{2}, \frac{A}{3}, \frac{3A}{2}$

$$(i) \sin 2A = 2 \sin A \cos A = \frac{2 \tan A}{1 + \tan^2 A}$$

$$\begin{aligned}
 \text{(ii)} \quad \cos 2A &= \cos^2 A - \sin^2 A \\
 &= 2\cos^2 A - 1 \\
 &= 1 - 2\sin^2 A \\
 &= \frac{1 - \tan^2 A}{1 + \tan^2 A}
 \end{aligned}$$

$$\text{(iii)} \quad \tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$\text{(iv)} \quad \sin 3A = 3 \sin A - 4 \sin^3 A$$

$$\text{(v)} \quad \cos 3A = 4 \cos^3 A - 3 \cos A$$

$$\text{(vi)} \quad \tan 3A = \frac{3 \tan A - \tan^3 A}{1 - 3 \tan^2 A}$$

$$\text{(vii)} \quad \sin A = 2 \sin\left(\frac{A}{2}\right) \cos\left(\frac{A}{2}\right) = \frac{2 \tan A/2}{1 + \tan^2 A/2}$$

$$\text{(ix)} \quad 1 + \cos 2A = 2 \cos^2 A$$

$$\text{(x)} \quad 1 - \cos 2A = 2 \sin^2 A$$

$$\text{(xi)} \quad \cos A = \cos^2\left(\frac{A}{2}\right) - \sin^2\left(\frac{A}{2}\right) = \frac{2 \cos^2 A/2 - 1}{2}$$

$$\frac{1 - 2 \sin^2 A/2}{2} = \frac{1 - \tan^2 A/2}{1 + \tan^2 A/2}$$

$$\text{(xii)} \quad \tan A = \frac{2 \tan A/2}{1 - \tan^2 A/2}$$

$$(i) 2\sin(A)\cos(B) = \sin(A+B) + \sin(A-B)$$

$$(ii) 2\cos A \sin B = \sin(A+B) - \sin(A-B)$$

$$(iii) 2\cos A \cos B = \cos(A+B) + \cos(A-B)$$

$$(iv) 2\sin A \sin B = \cos(A-B) - \cos(A+B)$$

$$(v) \sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$$

$$(vi) \sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$$

$$(vii) \cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$$

$$(viii) \cos C - \cos D = -2\sin\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$$

Time Saving Result

$$(i) \sec\theta + \tan\theta = \frac{1}{\sec\theta - \tan\theta}$$