Formula Sheet

$$\cos(\theta - \alpha) = \cos\theta\cos\alpha + \sin\theta\sin\alpha \qquad \cos(\theta + \alpha) = \cos\theta\cos\alpha - \sin\theta\sin\alpha$$

$$\sin(\theta - \alpha) = \sin\theta\cos\alpha - \cos\theta\sin\alpha \qquad \sin(\theta + \alpha) = \sin\theta\cos\alpha + \cos\theta\sin\alpha$$

$$\tan(\theta - \alpha) = \frac{\tan\theta - \tan\alpha}{1 + \tan\theta\tan\alpha} \qquad \tan(\theta + \alpha) = \frac{\tan\theta + \tan\alpha}{1 - \tan\theta\tan\alpha}$$

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

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

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

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

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

$$sin^2\theta = \frac{1 - \cos 2\theta}{2} \qquad cos^2\theta = \frac{1 + \cos 2\theta}{2} \qquad tan^2\theta = \frac{1 - \cos 2\theta}{1 + \cos 2\theta}$$

$$\sin\frac{\theta}{2} = \pm\sqrt{\frac{1 - \cos\theta}{2}} \qquad \cos\frac{\theta}{2} = \pm\sqrt{\frac{1 + \cos\theta}{2}}$$

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

$$\cos\theta\cos\alpha = \frac{1}{2}[\cos(\theta - \alpha) + \cos(\theta + \alpha)]$$

$$\sin\theta\sin\alpha = \frac{1}{2}[\cos(\theta - \alpha) - \cos(\theta + \alpha)]$$

$$\sin\theta\cos\alpha = \frac{1}{2}[\sin(\theta + \alpha) + \sin(\theta - \alpha)]$$

$$\cos\theta\sin\alpha = \frac{1}{2}[\sin(\theta + \alpha) - \sin(\theta - \alpha)]$$

$$\cos\theta + \cos\alpha = 2\cos\left(\frac{\theta + \alpha}{2}\right)\cos\left(\frac{\theta - \alpha}{2}\right)$$

$$\cos\theta - \cos\alpha = -2\sin\left(\frac{\theta + \alpha}{2}\right)\sin\left(\frac{\theta - \alpha}{2}\right)$$

$$\sin\theta + \sin\alpha = 2\sin\left(\frac{\theta + \alpha}{2}\right)\cos\left(\frac{\theta - \alpha}{2}\right)$$

$$\sin\theta - \sin\alpha = 2\sin\left(\frac{\theta - \alpha}{2}\right)\cos\left(\frac{\theta + \alpha}{2}\right)$$