Formula Sheet

Double Angle Identities:

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

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

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

$$cos^2\,\alpha = \frac{1 + cos\,2\alpha}{2}$$

$$cos\,2\alpha = 1 - 2\,sin^2\,\alpha$$
$$cos\,2\alpha = 2\,cos^2\,\alpha - 1$$

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

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

Product/Sum Identities:

$$cos\,\alpha\,cos\,\beta = \frac{1}{2}\left[cos(\alpha - \beta) + cos(\alpha + \beta)\right]$$

$$sin\,\alpha\,sin\,\beta = \frac{1}{2}\left[cos(\alpha - \beta) - cos(\alpha + \beta)\right]$$

$$sin\,\alpha\,cos\,\beta = \frac{1}{2}\left[sin(\alpha + \beta) + sin(\alpha - \beta)\right]$$

Sum/Product Identities:

$$sin\,\alpha + sin\,\beta = 2\,sin\frac{\alpha + \beta}{2}\,cos\frac{\alpha - \beta}{2}$$

$$sin\,\alpha - sin\,\beta = 2\,sin\frac{\alpha - \beta}{2}\,cos\frac{\alpha + \beta}{2}$$

$$cos\,\alpha + cos\,\beta = 2\,cos\frac{\alpha + \beta}{2}\,cos\frac{\alpha - \beta}{2}$$

$$cos\,\alpha - cos\,\beta = -2\,sin\frac{\alpha + \beta}{2}\,sin\frac{\alpha - \beta}{2}$$

Half Angles Identities:

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

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

$$tan\frac{\alpha}{2} = \pm\sqrt{\frac{1 - cos\,\alpha}{1 + cos\,\alpha}} \quad,\quad cos\,\alpha \neq -1$$

$$tan\frac{\alpha}{2} = \frac{sin\,\alpha}{1 + cos\,\alpha} \quad,\quad cos\,\alpha \neq -1$$

$$tan\frac{\alpha}{2} = \frac{1 - cos\,\alpha}{sin\,\alpha} \quad,\quad sin\,\alpha \neq 0$$