Основные тригонометрические соотношения для функций одного и того-же аргумента:

$$\sin^2\alpha + \cos^2\alpha = 1$$

$$\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$$

$$\cot\alpha = \frac{\cos\alpha}{\sin\alpha}$$

$$\tan\alpha\cot\alpha = 1$$

$$\sec\alpha = \frac{1}{\cos\alpha}$$

$$\csc\alpha = \frac{1}{\sin\alpha}$$

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

$$1 + \cot^2\alpha = \frac{1}{\sin^2\alpha}$$

Формулы сложения и вычитания аргументов тригонометрических функций:

$$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \sin\beta\cos\alpha$$

$$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \pm \sin\alpha\sin\beta$$

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

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

$$\cot(\alpha + \beta) = \frac{\cot\alpha\cot\beta - 1}{\cot\alpha + \cot\beta}$$

$$\cot(\alpha - \beta) = \frac{\cot\alpha\cot\beta + 1}{\cot\alpha - \cot\beta}$$

Формулы преобразования суммы и разности тригонометрических функций в произведение:

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

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

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

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

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

$$\cos\alpha + \sin\alpha = \sqrt{2}\cos(45^\circ - \alpha)$$

$$\cos\alpha - \sin\alpha = \sqrt{2}\sin(45^\circ - \alpha)$$

$$\tan\alpha + \tan\beta = \frac{\sin(\alpha+\beta)}{\cos\alpha\cos\beta}$$

$$\tan\alpha - \tan\beta = \frac{\sin(\alpha-\beta)}{\cos\alpha\cos\beta}$$

$$\cot\alpha + \cot\beta = \frac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$$

$$\cot\alpha - \cot\beta = \frac{\sin(\beta-\alpha)}{\sin\alpha\sin\beta}$$

$$\tan\alpha + \cot\beta = \frac{\cos(\alpha-\beta)}{\cos\alpha\sin\beta}$$

$$\tan\alpha - \cot\beta = -\frac{\cos(\alpha+\beta)}{\cos\alpha\sin\beta}$$

$$\tan\alpha + \cot\alpha = \frac{2}{\sin 2\alpha}$$

$$\tan\alpha - \cot\alpha = -2\cot 2\alpha$$

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

$$1+\sin\alpha = 2\cos^2\left(45^\circ - \frac{\alpha}{2}\right)$$

$$1-\sin\alpha = 2\sin^2\left(45^\circ - \frac{\alpha}{2}\right)$$

$$1+\tan\alpha = \frac{\sqrt{2}\sin(45^\circ+\alpha)}{\cos\alpha}$$

$$1-\tan\alpha = \frac{\sqrt{2}\sin(45^\circ-\alpha)}{\cos\alpha}$$

$$1+\tan\alpha\tan\beta = \frac{\cos(\alpha-\beta)}{\cos\alpha\cos\beta}$$

$$1-\tan\alpha\tan\beta = \frac{\cos(\alpha+\beta)}{\cos\alpha\cos\beta}$$

$$1+\cot\alpha\cot\beta = \frac{\cos(\alpha-\beta)}{\sin\alpha\sin\beta}$$

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

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

$$\tan^2\alpha - \tan^2\beta = \frac{\sin(\alpha+\beta)\sin(\alpha-\beta)}{\cos^2\alpha\sin^2\beta}$$

$$\tan^2\alpha - \sin^2\alpha = \tan^2\alpha\sin^2\alpha$$

$$\cot^2\alpha - \cos^2\alpha = \cot^2\alpha\cos^2\alpha$$

Формулы преобразования произведения тригонометрических функций в сумму:

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

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

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

$$\sin\alpha\sin\beta\sin\gamma = \frac{1}{4}\left(\sin(\alpha+\beta-\gamma) + \sin(\beta+\gamma-\alpha) + \sin(\gamma+\alpha-\beta) - \sin(\alpha+\beta+\gamma)\right)$$

$$\sin\alpha\sin\beta\cos\gamma = \frac{1}{4}\left(\sin(\alpha+\beta-\gamma) - \sin(\beta+\gamma-\alpha) + \sin(\gamma+\alpha-\beta) + \sin(\alpha+\beta+\gamma)\right)$$

$$\sin\alpha\sin\beta\cos\gamma = \frac{1}{4}\left(-\cos(\alpha+\beta-\gamma) + \cos(\beta+\gamma-\alpha) + \cos(\gamma+\alpha-\beta) - \cos(\alpha+\beta+\gamma)\right)$$

$$\cos\alpha\cos\beta\cos\gamma = \frac{1}{4}\left(\cos(\alpha+\beta-\gamma) + \cos(\beta+\gamma-\alpha) + \cos(\gamma+\alpha-\beta) + \cos(\alpha+\beta+\gamma)\right)$$

Формулы половинного аргумента:

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

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

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

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

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

$$\cot\frac{\alpha}{2} = \frac{1+\cos\alpha}{\sin\alpha} = \frac{\sin\alpha}{1-\cos\alpha}$$

Формулы выражающие тригонометрические функции через тангенс половинного аргумента:

$$\sin\alpha = \frac{2\tan\frac{\alpha}{2}}{1+\tan^2\frac{\alpha}{2}}$$

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

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

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

Формулы двойных и тройных аргументов:

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

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

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

$$\cot 2\alpha = \frac{\cot^2\alpha - 1}{2\cot\alpha}$$

$$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$$

$$\cos 3\alpha = 4\cos^3\alpha - 3\cos\alpha$$

$$\tan 3\alpha = \frac{3\tan\alpha - \tan^3\alpha}{1-3\tan^2\alpha}$$

$$\cot 3\alpha = \frac{3\cot\alpha - \cot^3\alpha}{1-3\cot^2\alpha}$$