

Trigonometric Formulae

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

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

$$\sec^2 x - \tan^2 x = 1$$

$$\operatorname{cosec}^2 x - \cot^2 x = 1$$

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$

$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$

$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$

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

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

$$\cos(2x) = 1 - 2 \sin^2 x$$

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

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

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

$$\cos\left(\frac{1}{2}x\right) = \pm \sqrt{\frac{1}{2}(1 + \cos x)}$$

Transformations

For ordered pairs in the plane: $\mathbb{R}^2 \rightarrow \mathbb{R}^2$

Translation

$$t_{p,q} : (x, y) \mapsto (x + p, y + q)$$

Rotation

$$r_\theta : (x, y) \mapsto (x \cos \theta - y \sin \theta, x \sin \theta + y \cos \theta)$$

Reflection

$$q_\theta : (x, y) \mapsto (x \cos 2\theta + y \sin 2\theta, x \sin 2\theta - y \cos 2\theta)$$