Trigonometry
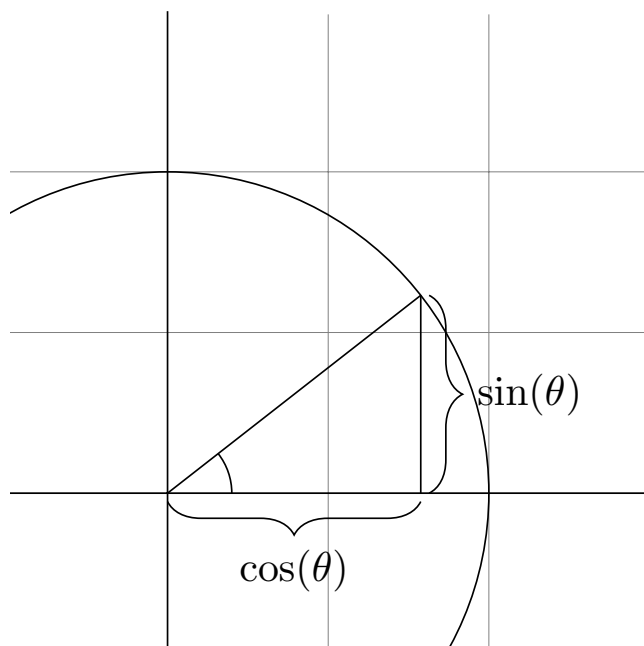
Definitions

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

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

$$\operatorname{cosec}\theta = \frac{1}{\sin\theta}$$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$$

Identities

$$\sin^2\theta + \cos^2\theta \equiv 1 \qquad 1 + \tan^2\theta \equiv \sec^2\theta \qquad 1 + \cot^2\theta \equiv \operatorname{cosec}^2\theta$$

$$\sin(\alpha + \beta) \equiv \sin\alpha\cos\beta + \cos\alpha\sin\beta \qquad \sin(\alpha - \beta) \equiv \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

$$\cos(\alpha + \beta) \equiv \cos\alpha\cos\beta - \sin\alpha\sin\beta \qquad \cos(\alpha - \beta) \equiv \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

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

$$\sin 2\theta \equiv 2\sin\theta\cos\theta$$

$$\cos 2\theta \equiv \cos^2\theta - \sin^2\theta$$
$$\equiv 2\cos^2\theta - 1$$
$$\tan 2\theta \equiv \frac{2\tan\theta}{1 - \tan^2\theta}$$
$$\equiv 1 - 2\sin^2\theta$$

Calculus

$$\frac{d}{dx}\sin x = \cos x$$

$$\int \sin x \ dx = -\cos x + C$$

$$\frac{d}{dx}\cos x = -\sin x$$

$$\int \cos x \ dx = \sin x + C$$

$$\frac{d}{dx}\tan x = \sec^2 x$$

$$\int \tan x \ dx = \ln|\sec x| + C$$

$$\frac{d}{dx}\sec x = \sec x \tan x$$

$$\int \sec x \ dx = \ln|\tan x + \sec x| + C$$

$$\frac{d}{dx}\operatorname{cosec} x = -\operatorname{cosec} x \cot x$$

$$\int \operatorname{cosec} x \ dx = -\ln|\cot x + \operatorname{cosec} x| + C$$

$$\frac{d}{dx}\cot x = -\operatorname{cosec}^2 x$$

$$\int \cot x \ dx = \ln|\sin x| + C$$

Graphs

$y = \sin(x)$

$y = \mathrm{cosec}(x)$

$y = \cos(x)$

$y = \sec(x)$

$y = \tan(x)$

$y = \cot(x)$