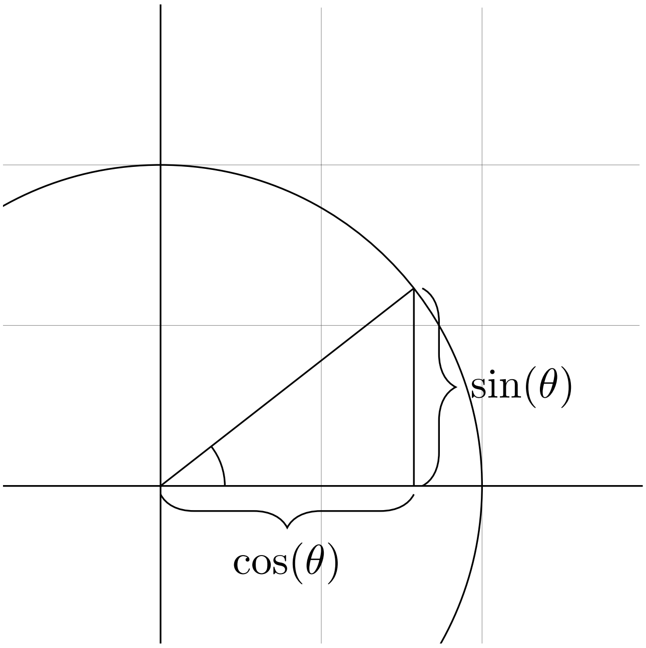
Trigonometry

Contents

Basics

Definitions



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

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

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

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

Identities

$$\sin^2\theta + \cos^2\theta \equiv 1$$

$$1 + \tan^2\theta \equiv \sec^2\theta$$

$$1 + \cot^2\theta \equiv \operatorname{cosec}^2\theta$$

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

$$\cos(\alpha \pm \beta) \equiv \cos\alpha\cos\beta \mp \sin\alpha\sin\beta$$

$$\tan(\alpha \pm \beta) \equiv \frac{\tan\alpha \pm \tan\beta}{1 \mp \tan\alpha\tan\beta}$$

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

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

$$\begin{aligned} \cos 2\theta &\equiv \cos^2\theta - \sin^2\theta \\ &\equiv 2\cos^2\theta - 1 \\ &\equiv 1 - 2\sin^2\theta \end{aligned}$$

Calculus

Remember

$$\frac{\mathrm{d}}{\mathrm{d}x}\sin x = \cos x \qquad \int \sin x \;\; \mathrm{d}x = -\cos x + C$$

$$\frac{\mathrm{d}}{\mathrm{d}x}\cos x = -\sin x \qquad \int \cos x \;\; \mathrm{d}x = \sin x + C$$

$$\int \arcsin x \;\; \mathrm{d}x = x \arcsin x + \sqrt{1-x^2} + C$$

$$\int \arccos x \;\; \mathrm{d}x = x \arccos x - \sqrt{1-x^2} + C$$

$$\int \arctan x \;\; \mathrm{d}x = x \arctan x - \frac{\ln(x^2+1)}{2} + C$$

Formula Book

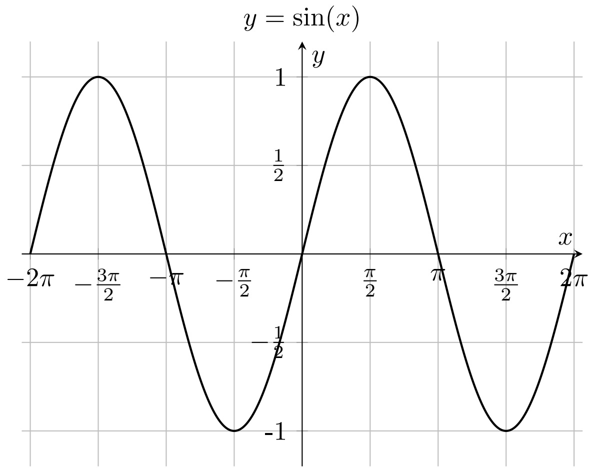
$$\frac{\mathrm{d}}{\mathrm{d}x}\tan x = \sec^2 x \qquad \int \tan x \;\; \mathrm{d}x = \ln|\sec x| + C \qquad \frac{\mathrm{d}}{\mathrm{d}x}\arcsin x = \frac{1}{\sqrt{1-x^2}}$$

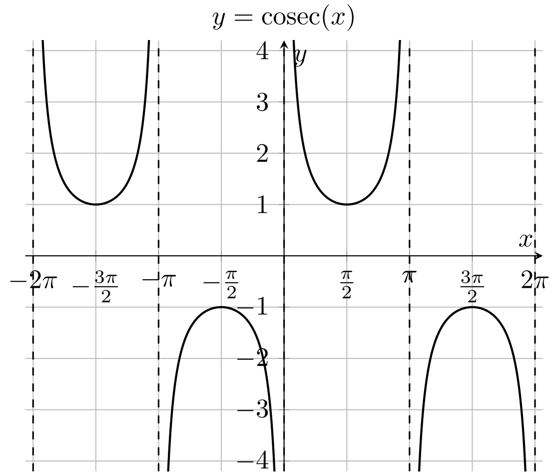
$$\frac{\mathrm{d}}{\mathrm{d}x}\sec x = \sec x \tan x \qquad \int \sec x \;\; \mathrm{d}x = \ln|\tan x + \sec x| + C \qquad \frac{\mathrm{d}}{\mathrm{d}x}\arccos x = -\frac{1}{\sqrt{1-x^2}}$$

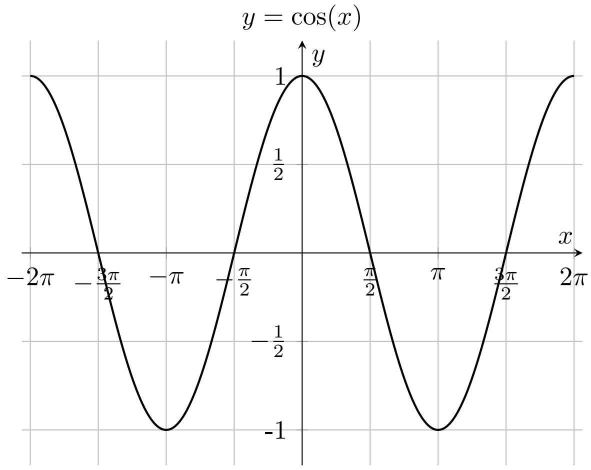
$$\frac{\mathrm{d}}{\mathrm{d}x}\operatorname{cosec} x = -\operatorname{cosec} x \cot x \qquad \int \operatorname{cosec} x \;\; \mathrm{d}x = -\ln|\cot x + \operatorname{cosec} x| + C \qquad \frac{\mathrm{d}}{\mathrm{d}x}\arctan x = \frac{1}{x^2+1}$$

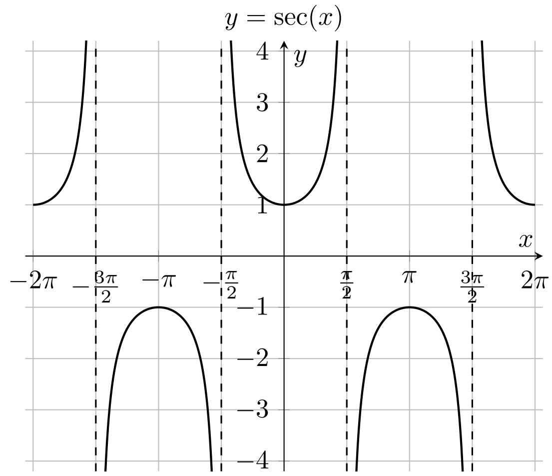
$$\frac{\mathrm{d}}{\mathrm{d}x}\cot x = -\operatorname{cosec}^2 x \qquad \int \cot x \;\; \mathrm{d}x = \ln|\sin x| + C$$

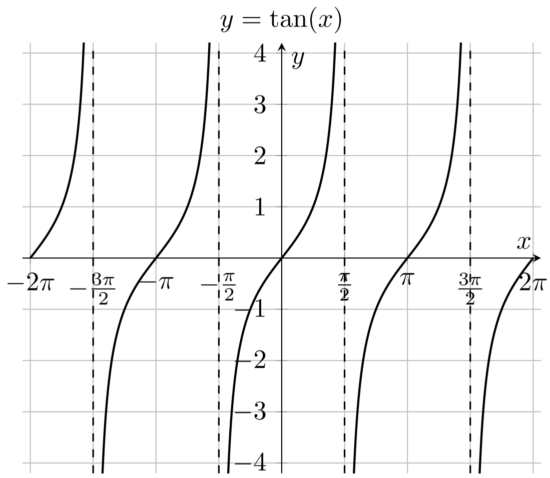
Graphs

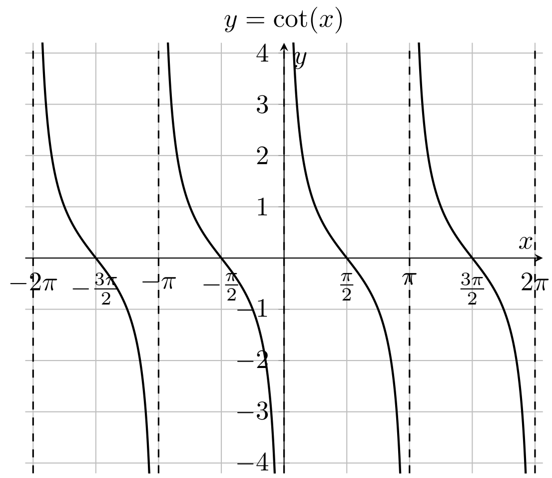

y = sin(x)
y
x
1
1/2
−1/2
-1
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π


y = cosec(x)
y
x
4
3
2
1
−1
−2
−3
−4
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π


y = cos(x)
y
x
1
1/2
−1/2
-1
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π


y = sec(x)
y
x
4
3
2
1
−1
−2
−3
−4
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π


y = tan(x)
y
x
4
3
2
1
−1
−2
−3
−4
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π


y = cot(x)
y
x
4
3
2
1
−1
−2
−3
−4
−2π
−3π/2
−π
−π/2
π/2
π
3π/2
2π