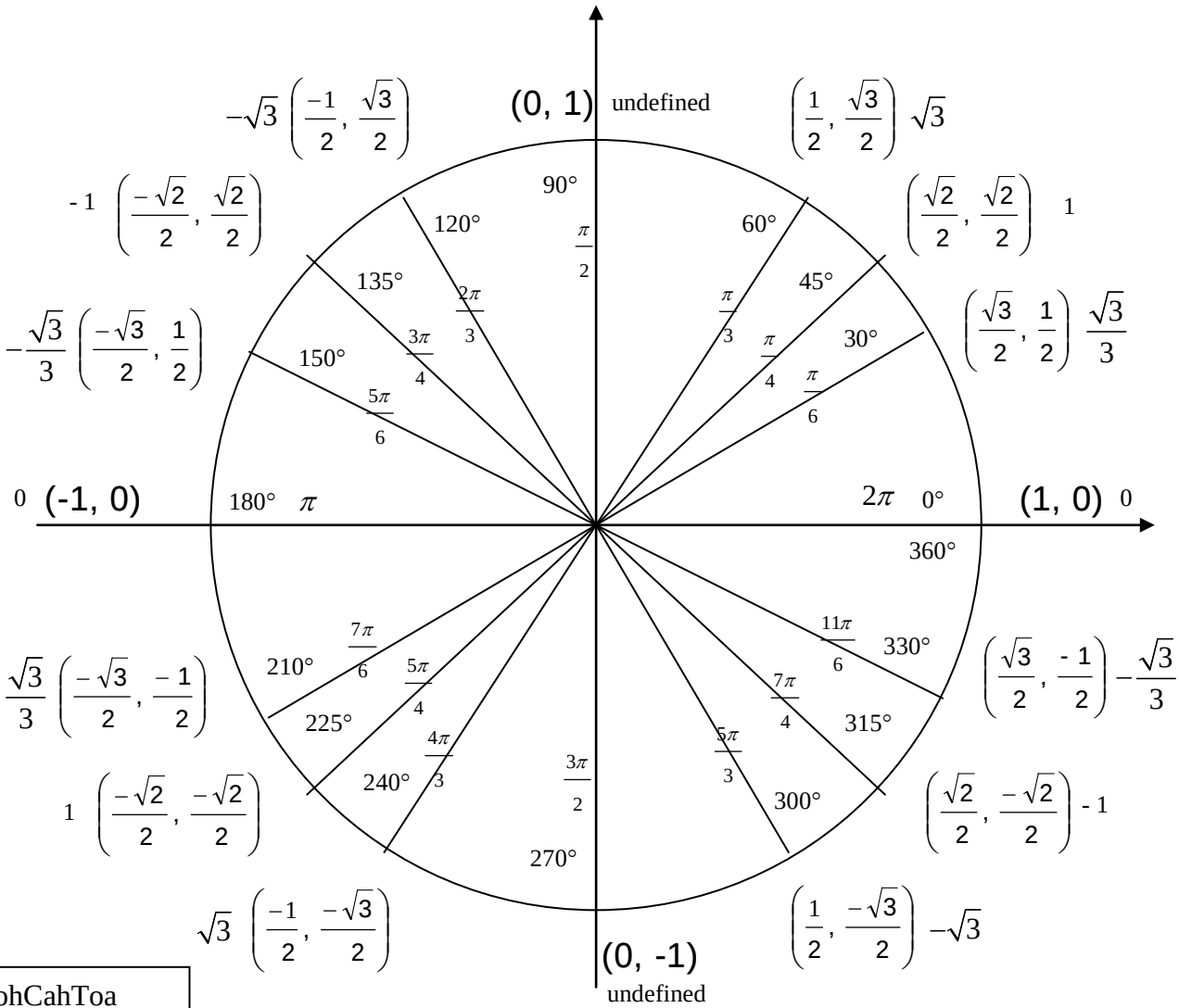
UNIT CIRCLE



SohCahToa

Pythagorean Triples:
3, 4, 5
5, 12, 13
8, 15, 17
7, 24, 25

Equation of a circle:

$$x^2 + y^2 = r^2$$

Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$

Reciprocals:

$1 \leftrightarrow 1$ $\quad und \leftrightarrow 0$

$2 \leftrightarrow \frac{1}{2}$ $\quad \frac{\sqrt{3}}{2} \leftrightarrow \frac{2\sqrt{3}}{3}$

$\frac{\sqrt{2}}{2} \leftrightarrow \sqrt{2}$ $\quad \frac{\sqrt{3}}{3} \leftrightarrow \sqrt{3}$

Trig Functions:

$$\sin\theta = \frac{y}{r} \qquad \csc\theta = \frac{r}{y}$$
$$\cos\theta = \frac{x}{r} \qquad \sec\theta = \frac{r}{x}$$
$$\tan\theta = \frac{y}{x} \qquad \cot\theta = \frac{x}{y}$$

TRIGONOMETRIC IDENTITIES

Pythagorean Relationships

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

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

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

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

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

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

$$1 + \cot^2\theta = \csc^2\theta$$

$$\csc^2\theta - 1 = \cot^2\theta$$

$$\csc^2\theta - \cot^2\theta = 1$$

Odd / Even

$$\sin(-\theta) = -\sin\theta$$

$$\cos(-\theta) = \cos\theta$$

$$\csc(-\theta) = -\csc\theta$$

$$\sec(-\theta) = \sec\theta$$

$$\tan(-\theta) = -\tan\theta$$

$$\cot(-\theta) = -\cot\theta$$

Sum / Difference

$$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$

$$\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

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

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

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

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

Power-Reducing Identities

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

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

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

Cofunction

$$\sin\theta = \cos(90° - \theta)$$

$$\cos\theta = \sin(90° - \theta)$$

$$\tan\theta = \cot(90° - \theta)$$

$$\cot\theta = \tan(90° - \theta)$$

$$\sec\theta = \csc(90° - \theta)$$

$$\csc\theta = \sec(90° - \theta)$$

Reciprocal / Quotient Relationships

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sin\theta = \frac{1}{\csc\theta}$$

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

$$\cot\theta = \frac{1}{\tan\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

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

Double Angle Identities

$$\sin 2\theta = 2\sin\theta\cdot\cos\theta \qquad \tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta$$

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

$$\cos 2\theta = 2\cos^2\theta - 1$$

Half Angle Identities

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

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

Whether the $+$ *or* $-$ sign is determined by the quadrant of angle $\frac{\alpha}{2}$, denominator $\neq 0$