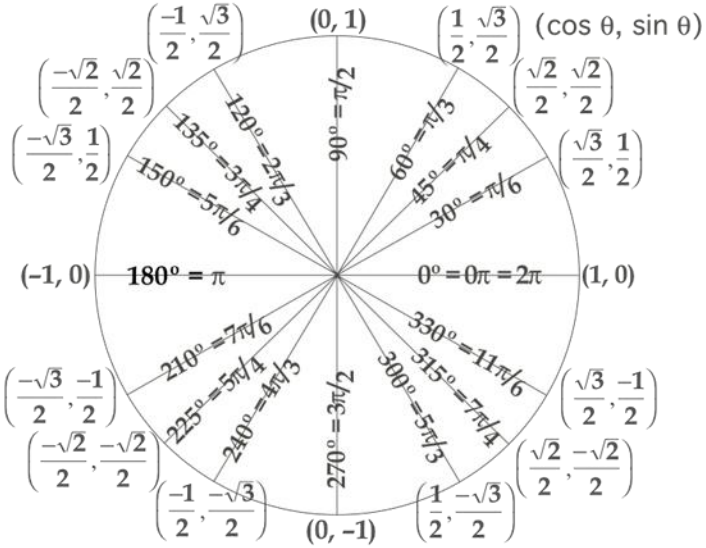
Unit Circle



Reciprocal Identities

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

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

Quotient Identities

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

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

Pythagorean Identities

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

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

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

Sum & Difference Identities

$\cos(u+v) = \cos u \cos v - \sin u \sin v$

$\cos(u-v) = \cos u \cos v + \sin u \sin v$

$\sin(u+v) = \sin u \cos v + \cos u \sin v$

$\sin(u-v) = \sin u \cos v - \cos u \sin v$

Double-Angle Identities

$\sin 2u = 2\sin u \cos u$

$$\cos 2u = \begin{cases} \cos^2 u - \sin^2 u \\ 2\cos^2 u - 1 \\ 1 - 2\sin^2 u \end{cases}$$

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

Law of Sines

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

Law of Cosines

$a^2 = b^2 + c^2 - 2bc\cos A$

$b^2 = a^2 + c^2 - 2ac\cos B$

$c^2 = a^2 + b^2 - 2ab\cos C$

Angle Between Two Vectors

$$\cos\theta = \frac{u \cdot v}{\|u\| \cdot \|v\|}$$

Work [on a constant force in any direction]

$$W = \|F\| \cdot \|\overrightarrow{AB}\| \cdot \cos\theta$$

Permutation

$${}_nP_r = \frac{n!}{(n-r)!}$$

Combination

$${}_nC_r = \frac{n!}{r!(n-r)!}$$

Arithmetic Sequences

Explicit Rule

$a_n = a_1 + (n-1)d$

Recursive Rule

$a_n = a_{n-1} + d$

Geometric Sequence

Explicit Rule

$a_n = a_1 \cdot r^{n-1}$

Recursive Rule

$a_n = a_{n-1} \cdot r$

Sum of a Finite Sequence:

Arithmetic

$$\sum_{k=1}^{n} a_k = n\left(\frac{a_1 + a_n}{2}\right)$$

Geometric

$$\sum_{k=1}^{n} a_k = \frac{a_1(1-r^n)}{1-r}$$

Sum of an Infinite Geometric Series

Converges for $|r| < 1$, otherwise the series Diverges

$$\sum_{k=1}^{\infty} a \cdot r^{k-1} = \frac{a}{1-r}$$

Limits

$\lim_{x \to a^-} f(x)$ The limit of f as x approaches a from the left.

$\lim_{x \to a^+} f(x)$ The limit of f as x approaches a from the right.