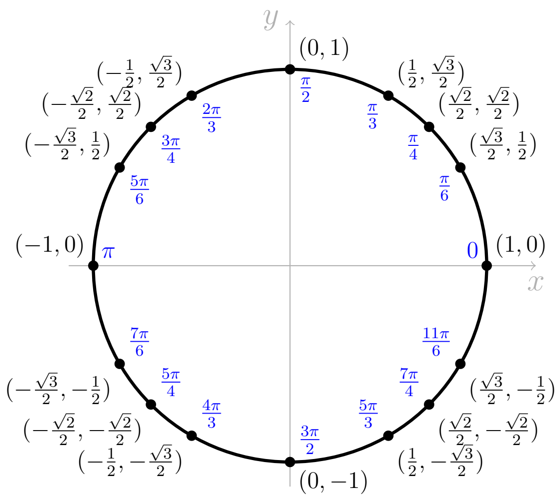
Formula Sheet

Quadratic Formula

$$ax^2 + bx + c = 0 \text{ when } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Common Angles



Principal Logarithm The argument is restricted to $(-\pi, \pi]$.

$$\mathrm{Log}(z) = \ln|z| + i\,\mathrm{Arg}\,z$$

Cauchy's Formula for Derivatives When f is holomorphic and C is a simple closed curve around w,

$$\oint_C \frac{f(z)}{(z-w)^{n+1}}\,dz = 2\pi i\,\frac{f^{(n)}(w)}{n!}.$$

Note: *When* $n = 0$ *this is Cauchy's Integral formula since* $0! = 1$.

Winding Number For a simple, closed, piecewise smooth curve $\gamma : [0, 2\pi] \to \mathbb{C}$ and a function f that is holomorphic in an open set containing the region enclosed by γ, the winding number of $f(\gamma(t))$ is

$$\frac{1}{2\pi i}\oint_\gamma \frac{f'(z)}{f(z)}\,dz = \#\text{ of zeros of } f \text{ inside } \gamma \text{ counting multiplicity.}$$

Common Maclaurin Series

- $e^z = \sum_{n=0}^{\infty} \frac{z^n}{n!}$
- $\sin(z) = \sum_{n=0}^{\infty} \frac{(-1)^n z^{2n+1}}{(2n+1)!}$
- $\cos(z) = \sum_{n=0}^{\infty} \frac{(-1)^n z^{2n}}{(2n)!}$
- $\frac{1}{1-z} = \sum_{n=0}^{\infty} z^n$