

Formula Sheet EE2M11

MaybE_Tree

2022-09-07

Principal
Argument

$$-\pi < \text{Arg}(z) \leq \pi$$

Triangle
Inequality

$$\begin{cases} |z_1 \pm z_2| \leq |z_1| + |z_2| \\ |z_1 \pm z_2| \geq |z_1| - |z_2| \end{cases}$$

Limits to
Infinity

$$\begin{cases} \lim_{z \rightarrow z_0} f(z) = \infty \iff \lim_{z \rightarrow z_0} \frac{1}{f(z)} = 0 \\ \lim_{z \rightarrow \infty} f(z) = L \iff \lim_{z \rightarrow 0} f\left(\frac{1}{z}\right) = L \end{cases}$$

L must be finite, maybe??

Cauchy-
Riemann

$$\begin{array}{cc} \text{CR1} & \begin{array}{cc} u & v \\ x & \frac{du}{dx} \quad \not\equiv \quad \frac{dv}{dx} \\ y & \frac{du}{dy} \quad \not\equiv \quad \frac{dv}{dy} \end{array} \end{array}$$

For

$$f(x, y) = u(x + y) + iv(x, y)$$

Harmonic
Check

$$\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2} = 0 \implies \frac{\iint_D f(z)}{\text{Area}(D)} = f(z_c)$$

For

f(x, y) = u(x + y) + iv(x, y)
Around a circular domain D
with centerpointn z_c

Exponential

$$e^z = e^x(\cos y + i \sin y)$$

Power

$$z^w = e^{w \log(z)}$$

Log

$$\text{Log}(z) = \ln |z| + i \arg(z)$$

$$-\pi < \text{Arg}(z) < \pi$$

Trig
Functions

$$\begin{cases} \sin z = \frac{1}{2i}(e^{iz} - e^{-iz}) \\ \cos z = \frac{1}{2}(e^{iz} + e^{-iz}) \\ \sinh z = \frac{1}{2}(e^z - z^{-z}) = -i \sin(iz) \\ \cosh z = \frac{1}{2}(e^z + e^{-z}) = \cos(iz) \end{cases}$$

Range of sin and cos
is not longer ±1 .

Zakarian
Identities

$$\begin{cases} \sin z = \sin x \cosh y + i \cos x \sinh y \\ \cos z = \cos x \cosh y - i \sin x \sinh y \end{cases}$$

Highschool
Identities

$$\begin{cases} \sin(z + w) = \sin z \cos w + \cos z \sin w \\ \cos(z + w) = \cos z \cos w - \sin z \sin w \end{cases}$$

Cauchy's
First Formula

$$2\pi i f(z_0) = \oint_C \frac{f(z)}{(z - z_0)}$$

Cauchy's	$\frac{2\pi i}{n!} f^n(z_0) = \int_C \frac{f(z)}{(z - z_0)^{n+1}}$	<i>For</i> $n = 0, 1, 2, \dots$
Second Formula		
Parama	$\int_C f(z) dz = \int_a^b f(z(t)) z'(t) dt$	

	0	$1/6\pi$	$1/4\pi$	$1/3\pi$	$1/2\pi$
sin	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1
cos	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0
tan	0	$\sqrt{3}/3$	1	$\sqrt{3}$???