Formula Sheet EE2M11

MaybE_Tree and Blazico

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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

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

L must be finite, maybe??

Cauchy-Riemann

$$\begin{array}{ccc} \text{CR1} & \text{u} & \text{v} \\ \text{x} & \frac{du}{dx} & \frac{dv}{dx} \\ \text{y} & \frac{du}{dy} & \frac{dv}{dy} \end{array}$$

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

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

$-\pi < Arg(z) < \pi$

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

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

Cauchy's Second Formula	$\frac{2\pi i}{n!} f^n(z_0) = \int\limits_C \frac{f(z)}{(z-z_0)^{n+1}}$	*For* $n = 0, 1, 2, ...$
Parama	$\int\limits_C f(z)dz = \int\limits_a^b f(z(t))z'(t)dt$	

	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	$\sqrt{3}$	???