Formula Sheet EE2M11

MaybE_Tree and Blazico

2022-09-07

1 Part 1

Principal Argument	$-\pi < \mathrm{Arg}(z) \leq \pi$	
Triangle Inequality	$\begin{cases} \lvert z_1 \pm z_2 \rvert \leq \lvert z_1 \rvert + \lvert z_2 \rvert \\ \lvert z_1 \pm z_2 \rvert \geq \lvert z_1 \rvert - \lvert z_2 \rvert \end{cases}$	
Limits to Infinity	$\begin{cases} \lim\limits_{z \to z_0} f(z) = \infty \iff \lim\limits_{z \to z_0} \dfrac{1}{f(z)} = 0 \\ \lim\limits_{z \to \infty} f(z) = L \iff \lim\limits_{z \to 0} f\left(\dfrac{1}{z}\right) = L \end{cases}$	*L must be finite, maybe??*
Cauchy-Riemann	$\begin{array}{ccc} \text{CR1} & \text{u} & \text{v} \\ \text{x} & \dfrac{du}{dx} & \dfrac{dv}{dx} \\ \text{y} & \dfrac{du}{dy} & \dfrac{dv}{dy} \end{array}$	*For* $f(x,y) = u(x+y) + iv(x,y)$
Harmonic Check	$\dfrac{\delta^2 u}{\delta x^2} + \dfrac{\delta^2 u}{\delta y^2} = 0 \implies \dfrac{\iint\limits_D f(z)}{\mathrm{Area}(D)} = f(z_c)$	*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	$\mathrm{Log}(z) = \ln \lvert z \rvert + i \arg(z)$	$-\pi < Arg(z) < \pi$
Trig Functions	$\begin{cases} \sin z = \dfrac{1}{2i}(e^{iz} - e^{-iz}) \\ \cos z = \dfrac{1}{2}(e^{iz} + e^{-iz}) \\ \sinh z = \dfrac{1}{2}(e^z - z^{-z}) = -i \sin(iz) \\ \cosh z = \dfrac{1}{2}(e^z + e^{-z}) = \cos(iz) \end{cases}$	*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	$2\pi i f(z_0) = \int\limits_C \frac{f(z)}{(z-z_0)}$	
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	$\int\limits_C f(z)dz = \int\limits_a^b f(z(t))z'(t)dt$	

2 Part 2

Taylor Theorem	$\begin{cases} f(z) = \sum_{n=0}^{\infty} a_n (z-z_0)^n \\ a_n = \frac{f^{[n]}(z_0)}{n!} \end{cases}$	
Binomial Expansion	$z^n + n = z_1 \cdot z_2 \cdot z_3 \cdot ...$	z_1 represents the nth root of $\sqrt[n]{z^n}$

	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	$\sqrt{3}$	???