$$f(z) = \frac{1}{\pi i} \int_{C} \frac{f(z') dz'}{z' - z}$$

$$=\frac{1}{2\pi i}\int \frac{f(z')dz'}{(z'-z_0)-(z-z_0)}$$

$$= \frac{1}{2\pi i} \int \frac{f(z) dz'}{(z'-z_0)(1-\frac{z-z_0}{z'-z_0})}$$

$$= \frac{1}{2\pi i} \int_{\mathbb{Z}} \frac{1}{z^{2}-z^{2}} \left[1 + \frac{z-z^{2}}{z^{2}-z^{2}} + \left(\frac{z-z^{2}}{z^{2}-z^{2}}\right)^{2} + 1/1 \right] \sqrt{z}$$

$$= \frac{1}{2\pi i} \int_{\mathbb{Z}} \frac{1}{z^{2}-z^{2}} \left[1 + \frac{z-z^{2}}{z^{2}-z^{2}} + \left(\frac{z-z^{2}}{z^{2}-z^{2}}\right)^{2} + 1/1 \right] \sqrt{z}$$

$$= \frac{1}{2\pi i} \int_{\mathbb{Z}} \frac{1}{z^{2}-z^{2}} \left[1 + \frac{z-z^{2}}{z^{2}-z^{2}} + \left(\frac{z-z^{2}}{z^{2}-z^{2}}\right)^{2} + 1/1 \right] \sqrt{z}$$

$$= \frac{1}{2\pi i} \int_{\mathcal{Z}} \left[\frac{f(z')}{z'-z_o} + \frac{f(z')}{(z'-z_o)^2} (z-z_o) + \frac{f(z')}{(z'-z_o)^3} (z-z_o)^2 \right] dz'$$

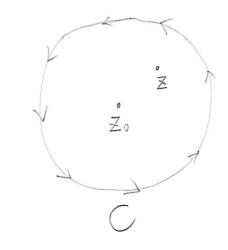
$$= \left[\frac{1}{2\pi i} \oint_{C} \frac{f(\vec{z}')d\vec{z}'}{\vec{z}'-\vec{z}_{o}}\right] + \left[\frac{1}{2\pi i} \oint_{C} \frac{f(\vec{z}')d\vec{z}'}{(\vec{z}'-\vec{z}_{o})^{2}}\right] (\vec{z}-\vec{z}_{o}) + \left[\frac{1}{2\pi i} \oint_{C} \frac{f(\vec{z})d\vec{z}'}{(\vec{z}'-\vec{z}_{o})^{3}}\right] (\vec{z}-\vec{z}_{o})^{2} + \cdots$$

laylor Expansion

$$=\sum_{n=0}^{\infty}\left(\frac{1}{2\pi i}\int_{C}\frac{f(z')dz'}{(z'-z_0)^{n+1}}\right)(z-z_0)^n$$

$$= \sum_{N=0}^{\infty} \frac{1}{N!} \left(\frac{N!}{2\pi i} \right) \frac{f(z) dz^{1}}{(z'-z_{0})^{n+1}} \left(z - z_{0} \right)^{N}$$

$$= \sum_{n=0}^{\infty} \frac{1}{n!} \left(z^{-2^{2}} \right)^{n}$$



$$f(z) = \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{z'-z} = \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{(z'-z_0)(1-\frac{z-z_0}{z'-z_0})} - \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{(z-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{(z-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{(z'-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{1}{2\pi i} \int_{C} \frac{f(z')dz'}{(z'-z_0)} - \frac{f(z')dz'}{(z'-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{f(z'-z_0)(\frac{z'-z_0}{z-z_0})}{(z'-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{f(z'-z_0)(\frac{z'-z_0}{z-z_0})}{(z'-z_0)(\frac{z'-z_0}{z-z_0})} - \frac{f(z'-z_0)(\frac{z'-z_0}{z-z$$

$$= \sum_{n=0}^{\infty} \left[\frac{1}{2\pi i} \int_{C_{1}}^{\infty} \frac{f(z')dz'}{(z'-z_{0})^{N+1}} \right] (Z-Z_{0})^{n} + \frac{1}{2\pi i} \int_{C_{2}}^{\infty} \frac{f(z')}{Z-Z_{0}} \left[1 + \frac{Z'-Z_{0}}{Z-Z_{0}} + \left(\frac{Z'-Z_{0}}{Z-Z_{0}} \right)^{2} + \cdots \right] dZ'$$

$$= 111 + \left[\frac{1}{2\pi i} \int_{C_{2}}^{\infty} f(z')dz' \right] (Z-Z_{0})^{-1} + \left[\frac{1}{2\pi i} \int_{C_{2}}^{\infty} f(z')(Z'-Z_{0})dz' \right] (Z-Z_{0})^{-2} + \cdots \right] dZ'$$

$$+ \left[\frac{1}{2\pi i} \int_{C_{2}}^{\infty} \frac{f(z')dz'}{(z'-z_{0})^{2}} \right] (Z-Z_{0})^{-3} + 111$$

$$+\left[\frac{1}{2\pi i}\int_{C_{2}}\frac{f(z')dz'}{(z'-z_{0})^{2}}\right](z-z_{0})^{-3}+111$$

$$= \sum_{n=0}^{\infty} \left[\frac{1}{2\pi i} \int_{C_1} \frac{f(z)dz^1}{(z^2-z)^{n+1}} \right] (z-z_0)^n$$

$$+\sum_{N=-1}^{-\infty}\left(\frac{1}{2\pi i}\int_{C_2}\frac{f(z')dz'}{(z'-z_o)^{N+1}}(z-z_o)^{N}\right)$$

