

$$z\gamma \in \sum_{\mathbb{Z} \ni n} (z-o)^n \underset{\#}{\circ}\gamma_n$$

$$\underset{\#}{\circ}\gamma_n = \int_{dw/2\pi i}^{\circ\bar{C}^e} \frac{w\gamma}{(w-o)^{n+1}}$$

$${}^{\circ}\text{Res}\gamma = \underset{\#}{\circ}\gamma_{-1} = \int_{dw/2\pi i}^{\circ\bar{C}^e} w\gamma$$

$$\underset{\#}{\circ}\text{deg}\gamma = \min \left\{ n \in \mathbb{Z} \quad \text{sub-deg} \right. \\ \left. \underset{\#}{\circ}\gamma_n \right.$$

$$\underset{\#}{\circ}\text{deg}\gamma\uparrow = \underset{\#}{\circ}\text{deg}\gamma + \underset{\#}{\circ}\text{deg}\uparrow$$

$$\begin{cases} \underset{\#}{\circ}\text{deg}\gamma \geq -1 \\ \underset{\#}{\circ}\text{deg}\uparrow \geq 0 \end{cases} \Rightarrow {}^{\circ}\text{Res}\gamma\uparrow = {}^{\circ}\text{Res}\gamma \cdot \underset{\#}{\circ}\uparrow = {}^{\circ}\text{Res}\gamma \cdot \underset{\#}{\circ}\text{Ev}\uparrow$$

$$z\gamma\uparrow z = \frac{\underset{\#}{\circ}\gamma_{-1} \cdot \underset{\#}{\circ}\uparrow_0}{z-o} + \sum_{n \geq 1} (z-o)^{n-1} \underset{\#}{\circ}\gamma_{-1} \underset{\#}{\circ}\uparrow_n + \sum_{m \geq 0} (z-o)^m \underset{\#}{\circ}\gamma_m \underset{\#}{\circ}\uparrow^z$$

$$\begin{cases} \underset{\#}{\circ}\text{deg}\gamma = 1 \\ \underset{\#}{\circ}\text{deg}\uparrow \geq 0 \end{cases} \Rightarrow {}^{\circ}\text{Res} \frac{\uparrow}{\gamma} \underset{\text{Ev}}{\text{Der}} \frac{\circ\uparrow}{\circ\gamma}$$

$${}^{\circ}\text{Res} \frac{\uparrow}{\gamma} = {}^{\circ}\text{Res} \frac{\uparrow}{z-o} \frac{z-o}{\gamma} = {}^{\circ}\text{Res} \frac{\uparrow}{z-o} \underset{\#}{\circ}\text{Ev} \frac{z-o}{\gamma} = \frac{\circ\uparrow}{\circ\gamma}$$

$$\underset{\#}{\circ}\text{deg}\gamma = -m < 0 \Rightarrow {}^{\circ}\text{Res}\gamma = \frac{1}{(m-1)!} \underset{\#}{\circ}(z-o)^{mz}\gamma$$

$$(z-o)^m \underset{\#}{\circ}\uparrow^z = \sum_{n \geq 0} (z-o)^n \underset{\#}{\circ}\gamma_{n-m} = \sum_{n \geq 0} (z-o)^n \underset{\#}{\circ}\uparrow_n \text{ hol at } o \Rightarrow {}^{\circ}\text{Res}\gamma = \underset{\#}{\circ}\gamma_{-1} = \underset{\#}{\circ}\uparrow_{m-1}$$

$${}^o \underline{\deg} \gamma = m \Rightarrow {}^o \text{Res} \frac{\gamma}{\gamma} = m = {}^o \underline{\deg} \gamma$$

$${}^z \gamma = \sum_{n \geq m} (z-o)^n \gamma_n = (z-o)^m {}^z \gamma$$

$${}^o \gamma = \gamma_m \neq 0$$

$${}^z \gamma = m(z-o)^{m-1} {}^z \gamma + (z-o)^m {}^z \gamma \Rightarrow \frac{{}^z \gamma}{z-o} = \frac{m}{z-o} + \frac{{}^z \gamma}{z-o} \text{ hol at } o$$

$${}^1_2 \text{Res} \frac{z}{(z-1)(z-2)^2} = \begin{cases} {}^1 \text{Ev} \frac{z}{(z-2)^2} = 1 \\ {}^2 \text{Der} \frac{z}{(z-1)} = -1 \end{cases}$$

$${}^3_4 \text{Res} \frac{2}{(z-3)^k (z-4)}$$

$${}^0_{-1} \text{Res} \frac{z e}{z(z+1)^2} = \begin{cases} {}^0 \text{Ev} \frac{z e}{(z+1)^2} = 1 \\ {}^{-1} \text{Der} \frac{z e}{z} = -\frac{2}{e} \end{cases}$$

$$k \in \mathbb{Z} \Rightarrow {}^{\pi k} \text{Res} \frac{1}{z^{\mathfrak{f}}} = \frac{1}{k\pi^{\mathfrak{c}}} = (-1)^k$$

$$a^n = -1 \Rightarrow {}^a \text{Res} \frac{z^{\mathfrak{f}}}{1+z^n} = \frac{a^{\mathfrak{f}}}{na^{n-1}} = -\frac{a^{\mathfrak{f}} a}{n}$$

$${}^k \text{Res} \cot(\pi z) = \frac{\pi^k \mathfrak{c}}{\pi^{\pi k \mathfrak{c}}} = \frac{1}{\pi}$$

$${}^0 \text{Res} \frac{1/z^{\mathfrak{c}}}{z^n} = {}^0 \text{Res} \sum_{m \geq 0} \frac{(-1)^m}{(2m)!} z^{-n-2m} = \begin{cases} \frac{(-1)^{1-n/2}}{(n-1)!} & 1 \leq n \text{ odd} \\ 0 & \text{sonst} \end{cases}$$

$${}^0 \text{Res} \frac{1+z^{\mathfrak{o}}}{z^2} = {}^0 \text{Res} \sum_{n \geq 1} \frac{(-1)^{n-1}}{n} z^{n-2} = 1$$