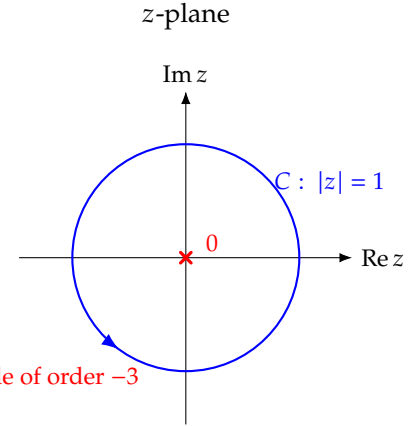

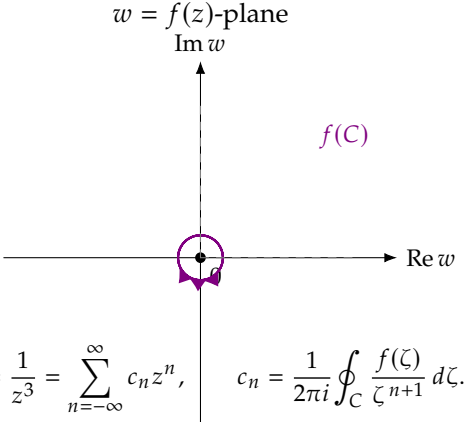

$$f(z) = \frac{1}{z^3} = \sum_{n=-\infty}^{\infty} c_n z^n, \qquad c_n = \frac{1}{2\pi i} \oint_C \frac{f(\zeta)}{\zeta^{n+1}}\, d\zeta.$$

$$f(z) = \frac{1}{z^3}, \quad \operatorname{ord}_0 f = \frac{1}{2\pi i} \oint_C \frac{df}{f} = \frac{1}{2\pi i} \oint_C \frac{f'(z)}{f(z)}\, dz = -3.$$

For $f(z) = 1/z^3$: $\quad c_{-3} = \frac{1}{2\pi i} \oint_C \frac{1}{\zeta^3}\, \zeta^2\, d\zeta = \frac{1}{2\pi i} \oint_C \frac{1}{\zeta}\, d\zeta = 1, \quad c_n = 0\ (n \neq -3).$

$$\operatorname{wind}\big(f(C), 0\big) = -3 \;\Rightarrow\; \oint_C \frac{f'(z)}{f(z)}\, dz = -2\pi i \cdot 3.$$