- **Integrals of holomorphic function:**
  - Given $f(t)$ a function that that describe a CLOSED curve γ and I is an integral of form:

$$I = \int_{\gamma} \frac{h(z)}{g(z)}\, dz$$

→ when $h(z)$ and $g(z)$ is holomorphic

- if the poles of $g(z)$ do <u>NOT</u> belong INSIDE the curve γ
  ⟶ $I = \emptyset$
- if they do belong and p_0 (pole) is simple (multiplicity 1)
  ⟶ $\mathrm{Res}\left\{ \frac{h(z)}{g(z)}, p_0 \right\} = \lim_{z \to p_0} \left[\frac{h(z)}{g(z)} \cdot (z - p_0) \right]$
  ⟶ $I = \pm 2\pi i \cdot \mathrm{Res}\left\{ \frac{h(z)}{g(z)}, p_0 \right\}$
  - $+$ if γ COUNTERCLO.
  - $-$ if γ CLOCKWISE
- If the pole has multiplicity $(\mu > 1)$, is <u>complex</u>:
  ↳ $\mathrm{Res}\left\{ \frac{h(z)}{g(z)}; p_0 \right\} = \frac{1}{(\mu - 1)!} \cdot \lim_{z \to p_0} \left\{ \left(\frac{\partial}{\partial z} \right)^{(\mu - 1)} \left[\frac{h(z)}{g(z)} \cdot (z - p_0)^{\mu} \right] \right\}$

- Then if a function has more poles $\rightarrow$ we have k 'Residui" $Res\{p_k\}$

$\rightarrow I = 2\pi i \left(Res\{p_1\} + \dots + Res\{p_k\} \right)$

where $Res\{\cdot, p_\cdot\}$ are defined as written above.