2. M complex manifold, $V \subset M$ submanifold.
$\mathcal{O}_V$ sheaf by extension by zero.

The sequence
$$0 \longrightarrow \mathcal{J}_V \xrightarrow{i} \mathcal{O}_M \xrightarrow{r} \mathcal{O}_V \longrightarrow 0$$
is exact.

$\ker i = 0 \Leftarrow i_U(\sigma) = 0 \quad \sigma = 0$ on $U \cap V$ al $U \Rightarrow \sigma = 0$ on U.

$\operatorname{Im} r = \mathcal{O}_V$.
Given $\sigma \in \mathcal{O}_V(U)$, $\sigma \in \mathcal{O}_M(U \cap V)$ $p \in U$.
We can extend σ as follows

$\Rightarrow \quad U \cap V \times \mathbb{C}^n \xrightarrow{\tilde{\sigma}} \mathbb{C}$

$\tilde{\sigma}(x, y) = \sigma(x)$.

3. By the ordinary Poincare lemma, the sequence
$$0 \longrightarrow \mathbb{R} \longrightarrow C^\infty \xrightarrow{d} \mathcal{A}^1 \xrightarrow{d} \mathcal{A}^2 \longrightarrow \cdots$$
is exact on any real manifold.

Every closed form on a contractible open set is exact.

4. By the $\bar{\partial}$- Poincare lemma, the sequence
$$0 \longrightarrow \Omega^p \longrightarrow \mathcal{A}^{p,0} \xrightarrow{\bar{\partial}} \mathcal{A}^{p,1} \xrightarrow{\bar{\partial}} \mathcal{A}^{p,2} \longrightarrow$$
by $\bar{\partial}$ - Poincare lemma.
is exact on any complex manifold.

$\ker \bar{\partial}$ on $\mathcal{A}^{p,0} = \Omega^p$. since locally. $f\, dz_I$
$\bar{\partial}(f\, dz_I) = \bar{\partial} f = 0$ f is holomorphic where $|I| = p$