

$$\pi^* f \otimes \sigma_i^{-1}|_E : \mathcal{O}_i \longrightarrow \mathbb{C}$$

$$\left(\frac{l_1}{l_i}, \dots, \frac{l_n}{l_i}\right) \longmapsto \frac{l_1}{l_i} \frac{\partial f}{\partial z_1} + \dots + \frac{l_i}{l_i} \frac{\partial f}{\partial z_i} + \dots + \frac{l_n}{l_i} \frac{\partial f}{\partial z_n}$$

$\Rightarrow \{(\pi^* f \otimes \sigma_i^{-1}|_E, \mathcal{O}_i)\}$ represents a section of $[-E]$ over E . where divisor is $l_1 \frac{\partial f}{\partial z_1} + l_2 \frac{\partial f}{\partial z_2} + \dots + l_n \frac{\partial f}{\partial z_n} = 0$ in E . ----- (*)

Given $f \in H^0(U, \mathcal{I}_X)$, $d_X f = \sum \frac{\partial f}{\partial z_i} dz_i$, we need to know what is the corresponding element in $T_X^*(M)$.

To know this, we had better look closely the identifications between $H^0(E, \mathcal{O}(-E))$ and $T_X^*(M)$.

Given $\bar{\sigma} \in H^0(E, \mathcal{O}(-E))$, $\bar{\sigma}_i : \mathcal{O}_i(l_i \neq 0) \longrightarrow \mathbb{C}$ is given by $\bar{\sigma}_i([l_1, l_2, \dots, l_n]) = a_1 \frac{l_1}{l_i} + a_2 \frac{l_2}{l_i} + \dots + \frac{l_n}{l_i} a_n$.

$$\begin{array}{ccc} \Rightarrow H^0(E, \mathcal{O}(-E)) & \longrightarrow & T_X^*(M) \\ \downarrow & & \downarrow \\ \bar{\sigma} & \longmapsto & \sum a_j dz_j \end{array}$$

\Rightarrow For $d_X f = \sum \frac{\partial f}{\partial z_i} dz_i \in T_X^*(M)$, the corresponding element τ in $H^0(E, \mathcal{O}(-E))$ is given by

$$\begin{array}{ccc} \tau_i : \mathcal{O}_i & \longrightarrow & \mathbb{C} \\ [l_1 \dots l_n] & \longmapsto & \frac{l_1}{l_i} \frac{\partial f}{\partial z_1} + \dots + \frac{l_i}{l_i} \frac{\partial f}{\partial z_i} + \dots + \frac{l_n}{l_i} \frac{\partial f}{\partial z_n} \end{array}$$

\Rightarrow By (*). $\tau = \pi^* f \otimes \sigma^{-1}|_E \Rightarrow$ The diagram is commutative. J)