

$$\Rightarrow u_1^{n-1} du_1 \wedge df_2 \wedge \dots \wedge df_n \equiv 0 \Rightarrow df_2 \wedge \dots \wedge df_n \equiv 0 \text{ modulo } du_1$$

$$\Rightarrow df_2' \wedge \dots \wedge df_n' \equiv 0.$$

Since z_0 is a smooth point on D_1 , we can let $(f_1 = u_1, u_2, \dots, u_n)$ be coordinates around z_0 .

$$\Rightarrow df_1 \wedge \dots \wedge df_n = du_1 \wedge df_2 \wedge \dots \wedge df_n \equiv 0 \Rightarrow \text{For example,}$$

$$n=2, \quad du_1 \wedge df_2 = du_1 \wedge \left(\frac{\partial f_2}{\partial u_1} du_1 + \frac{\partial f_2}{\partial u_2} du_2 \right) \equiv 0$$

$$\Rightarrow \frac{\partial f_2}{\partial u_2} \equiv 0 \Rightarrow f_2 \text{ is independent of } u_2$$

$$\Rightarrow df_2' = df_2'(0, u_2) \equiv 0.$$

$$\text{In case } n=3, \quad df_1 \wedge df_2 \wedge df_3 = du_1 \wedge df_2 \wedge df_3$$

$$= du_1 \wedge \left(\frac{\partial f_2}{\partial u_2} du_2 + \frac{\partial f_2}{\partial u_3} du_3 \right) \wedge \left(\frac{\partial f_3}{\partial u_2} du_2 + \frac{\partial f_3}{\partial u_3} du_3 \right)$$

$$= du_1 \wedge \left(\frac{\partial f_2}{\partial u_2} \frac{\partial f_3}{\partial u_3} - \frac{\partial f_2}{\partial u_3} \frac{\partial f_3}{\partial u_2} \right) du_2 \wedge du_3 \equiv 0$$

$$\Rightarrow \frac{\partial f_2}{\partial u_2} \frac{\partial f_3}{\partial u_3} = \frac{\partial f_2}{\partial u_3} \frac{\partial f_3}{\partial u_2}$$

$$\Rightarrow df_2' \wedge df_3' = df_2'(0, u_2, u_3) \wedge df_3'(0, u_2, u_3)$$

$$= \left(\frac{\partial f_2}{\partial u_2} \frac{\partial f_3}{\partial u_3} - \frac{\partial f_2}{\partial u_3} \frac{\partial f_3}{\partial u_2} \right) du_2 \wedge du_3 \equiv 0. \quad \square$$

On the other hand, if we let $f_i'(z_0) = w_i'$, then the equations $f_i'(z') = w_i'$ have z_0 as an isolated solution on D_1 near z_0 .

If z_0 is not isolated, then for each n , $\exists \eta_n \in D_1$ s.t. $\|\eta_n\| < \frac{1}{n}$ and $f_2(\eta_n) = 0$. \Rightarrow This contradicts to the fact that $f_1^{-1}(0) \cap f_2^{-1}(0) = \{0\}$. $\Rightarrow z_0$ is isolated solution for $f_i'(z') = w_i'$. $z_0 = (0, z_0') \Rightarrow f_i'(z_0) = w_i'$ \square

Don't be confused with notations.