$$\frac{\partial}{\partial z_i} = \sum g_{ij} \frac{\partial}{\partial w_j},$$

and hence

$$v(z) = \sum_{i,j,k,\ell} a_{ij}\, g_{ik}^{-1}\, w_k \cdot g_{\ell j} \cdot \frac{\partial}{\partial w_\ell} + [\partial].$$

Pr

$$v(z) = \sum a_{ij}\, z_i \frac{\partial}{\partial z_j} + [\partial]$$

$$= \sum a_{ij}\, (g_{ik}^{-1} w_k)\, g_{\ell j} \frac{\partial}{\partial w_\ell} + [\partial]$$

for, $w = f(z) \Rightarrow w_1 = f_1(z). \cdots w_n = f_n(z).$

$$w_1 = 0 + \frac{\partial f_1}{\partial z_1}(0)\, z_1 + \cdots + \frac{\partial f_1}{\partial z_n}(0)\, z_n + [\partial]$$

$$= g_{11} z_1 + \cdots + g_{1n} z_n + [\partial].$$

$$\vdots$$

$$w_n = g_{n1} z_1 + \cdots + g_{nn} z_n + [\partial].$$

$$f \circ f^{-1} = id$$

$$J(f \circ f^{-1}) = id = J(f)\, J(f^{-1}) = (g_{ij})\,(g_{jk}^{-1}) = (\delta_{ik}).$$

$$\Rightarrow \begin{pmatrix} z_1 \\ \vdots \\ z_n \end{pmatrix} = (g_{ij}^{-1}) \begin{pmatrix} w_1 \\ \vdots \\ w_n \end{pmatrix} + [\partial].$$

$$\Rightarrow z_i = g_{ik}^{-1} w_k + [\partial].$$

┘

Thus $A_p' = {}^t g^{-1} \cdot A_p \cdot {}^t g,$