$$\frac{\partial z^{4}}{\partial w_{1}} = \begin{bmatrix} \partial z^{4} \\ \partial z_{2}^{3} \end{bmatrix} \frac{\partial z_{3}^{2}}{\partial z_{3}^{2}} \frac{\partial z_{3}^{2}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{2}^{3} \end{bmatrix} \frac{\partial z_{2}^{2}}{\partial z_{2}^{2}} \frac{\partial z_{2}^{2}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{2}^{3} \end{bmatrix} \frac{\partial z_{2}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{1}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{2}^{2}} \frac{\partial z_{2}^{2}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{1}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{1}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{1}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{1}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{2}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{2}^{3}}{\partial z_{1}^{2}} \frac{\partial z_{2}^{3}}{\partial w_{1}} + \begin{bmatrix} \partial z^{4} \\ \partial z_{1}^{3} \end{bmatrix} \frac{\partial z_{2}^{3}}{\partial z_{1}^{3}} \frac{\partial z_{2}^{3}}{\partial z_{2}^{3}} \frac{\partial z_{2}^{3}}{\partial z_{1}^{3}} \frac{\partial z_{2}^{3}}{\partial z_{2}^{3}} \frac{\partial z_{2}^{3}}{\partial z_{1}^{3}} \frac{\partial z_{2}^{3}}{\partial z_{2}^{3}} \frac{\partial$$