$$\frac{\partial z^4}{\partial w_1} = \frac{\partial z^4}{\partial z_2^3}\frac{\partial z_2^3}{\partial z_3^2}\frac{\partial z_3^2}{\partial w_1} + \frac{\partial z^4}{\partial z_2^3}\frac{\partial z_2^3}{\partial z_2^2}\frac{\partial z_2^2}{\partial w_1} + \frac{\partial z^4}{\partial z_2^3}\frac{\partial z_2^3}{\partial z_1^2}\frac{\partial z_1^2}{\partial w_1}$$
$$+ \frac{\partial z^4}{\partial z_1^3}\frac{\partial z_1^3}{\partial z_3^2}\frac{\partial z_3^2}{\partial w_1} + \frac{\partial z^4}{\partial z_1^3}\frac{\partial z_1^3}{\partial z_2^2}\frac{\partial z_2^2}{\partial w_1} + \frac{\partial z^4}{\partial z_1^3}\frac{\partial z_1^3}{\partial z_1^2}\frac{\partial z_1^2}{\partial w_1}$$