

$$z = x^{\textcolor{red}{2}} \ln(y^{\textcolor{red}{4}}) \quad \Rightarrow \quad dz = \frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy$$

$$dz = \textcolor{red}{2}x \ln(y^{\textcolor{red}{4}}) dx + x^{\textcolor{red}{2}} \cdot \frac{1}{y^{\textcolor{red}{4}}} (\textcolor{red}{4}y^{\textcolor{red}{3}}) dy = \textcolor{red}{2}x \ln(y^{\textcolor{red}{4}}) dx + \frac{4x^{\textcolor{red}{2}}}{y} dy$$