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

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