

1. $dw = ze^y dx + zue^y dy + ue^y dz + e^z dx + ue^z dz$
 $+ e^z dy + ye^z dz$

2. $dw = (ze^y + e^z)dt + (zue^y + e^z)2t dt$
 $+ (ue^y + ue^z + ye^z)3t^2 dt$

3.

$$(2xy + y^2)dx + (x^2 + 2xy)dy = 0 \quad \text{in } \mathbb{R}^2$$

$$\Rightarrow \frac{x^2 + 2xy + y^2}{x^2 + 2xy} = \frac{dw}{dx}$$