

$$= \frac{dz}{dt} = \frac{2te^{t^2}}{x^2 + y^2} + \frac{2y(3t^2 + 1)}{x^2 + y^2}$$

$$\frac{dz}{dt} = \frac{2te^{t^2} + (2t^3 + 2t)(3t^2 + 1)}{t^2 + (t^3 + t)^2}$$

5) $w = u \cos v^2$, $u = x^3 + y$, $v = x^2 y$

$$\frac{\partial w}{\partial x} = \frac{\partial w}{\partial u} \cdot \frac{\partial u}{\partial x} + \frac{\partial w}{\partial v} \cdot \frac{\partial v}{\partial x}$$

$$\begin{aligned} \frac{\partial w}{\partial x} &= \cos(v^2)(3x^2) + (-2vu \sin(v^2))(2xy) \\ &= 3x^2 \cos(v^2) - 4vu \sin(v^2) \end{aligned}$$

$$\frac{\partial w}{\partial y} = \frac{\partial w}{\partial u} \cdot \frac{\partial u}{\partial y} + \frac{\partial w}{\partial v} \cdot \frac{\partial v}{\partial y}$$

$$\begin{aligned} \frac{\partial w}{\partial y} &= \cos(v^2)(1) + (-2vu \sin(v^2))(x^2) \\ &= \cos(v^2) - 2vu x^2 \sin(v^2) \end{aligned}$$

6) $\frac{\partial z}{\partial x} = \frac{\partial z}{\partial u} \cdot \frac{\partial u}{\partial x} + \frac{\partial z}{\partial v} \cdot \frac{\partial v}{\partial x} + \frac{\partial z}{\partial w} \cdot \frac{\partial w}{\partial x}$

$$\frac{\partial z}{\partial x} = (2u)(e^{-5}) + (2v)(-v^2 e^{-v}) + (2w)(e^5)$$