

(800, #10) Find  $\frac{\partial z}{\partial s}$  and  $\frac{\partial z}{\partial t}$  for  $z = \arctan(xy)$ ,  $x = t^2$ ,  $y = se^t$

Solution:

$$\frac{\partial z}{\partial s} = \frac{\partial z}{\partial x} \frac{\partial x}{\partial s} + \frac{\partial z}{\partial y} \frac{\partial y}{\partial s} = \frac{y}{1+(xy)^2} * 0 + \frac{x}{1+(xy)^2} e^t = \frac{t^2 e^t}{1+t^4 s^2 e^{2t}}$$

$$\frac{\partial z}{\partial t} = \frac{\partial z}{\partial x} \frac{\partial x}{\partial t} + \frac{\partial z}{\partial y} \frac{\partial y}{\partial t} = \frac{y}{1+(xy)^2} 2t + \frac{x}{1+(xy)^2} se^t = \frac{2ste^t}{1+t^4 s^2 e^{2t}} + \frac{t^2 se^t}{1+t^4 s^2 e^{2t}} = \frac{ste^t(2+t)}{1+t^4 s^2 e^{2t}}$$