Math 5B - Weekly quiz V
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Suppose $g(s,t) = f(x(s,t), y(s,t))$ and f is differentiable everywhere. Calculate $\frac{\partial g}{\partial s}(0,0)$ and $\frac{\partial g}{\partial t}(0,0)$ using the following information:

$\frac{\partial f}{\partial x}(3,1) = -1$ $\frac{\partial f}{\partial y}(3,1) = -2$

$x(s,t) = e^t + s + 2$ $y(s,t) = ts^2 + t + 1$

$x_s = 1$ $x_t = e^t$ $y_s = 2ts$ $y_t = s^2 + 1$

$x(0,0) = 3$ $y(0,0) = 1$

$$\frac{\partial g}{\partial s}(0,0) = \frac{\partial f}{\partial x}(3,1) \cdot \frac{\partial x}{\partial s}(0,0) + \frac{\partial f}{\partial y}(3,1) \cdot \frac{\partial y}{\partial s}(0,0)$$
$$= (-1) \cdot (1) + (-2) \cdot (0) = -1$$

$$\frac{\partial g}{\partial t}(0,0) = \frac{\partial f}{\partial x}(3,1) \cdot \frac{\partial x}{\partial t}(0,0) + \frac{\partial f}{\partial y}(3,1) \cdot \frac{\partial y}{\partial t}(0,0)$$
$$= (-1) \cdot (1) + (-2) \cdot (1) = -3$$

$\nabla g(0,0) = (-1, -3)$

OR $\frac{\partial g}{\partial s}(0,0) = -1$ $\frac{\partial g}{\partial t}(0,0) = -3$