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$$Df \cdot Dg = d(f \circ g)$$

$$f(x, y) = \sin x + \cos y$$

$$g(u, v) = (e^u + v, uv)$$

$$Dg = \begin{pmatrix} \frac{\partial g_1}{\partial u} & \frac{\partial g_1}{\partial v} \\ \frac{\partial g_2}{\partial u} & \frac{\partial g_2}{\partial v} \end{pmatrix} = \begin{pmatrix} e^u & 1 \\ v & u \end{pmatrix}$$

$$Df = \left(\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y} \right) = (\cos x, -\sin y)$$

$$F = e^{\cos x} \quad F' = \underbrace{\sin x}_{g(x)'} \cdot e^{\cos x}$$

$$Df \cdot Dg = D_{f \circ g} = \left(\cos(e^u + v), -\sin(uv) \right) \cdot \begin{pmatrix} e & 1 \\ u & v \end{pmatrix}$$

$$= \begin{pmatrix} \cos(e^u + v) \cdot e & \cos(e^u + v) - \sin(uv) \cdot u \\ \cos(e^u + v) \cdot v & \cos(e^u + v) - \sin(uv) \cdot v \end{pmatrix}$$

$$D_{f \circ g} |_{u=1, v=1}$$