

$$\frac{d}{dx} \int_{g_1(x)}^{g_2(x)} \underbrace{f(x, t)}_{h(g_3(x), t)} dt = ?$$

$$\frac{d}{dx} F(g_1(x), g_2(x), g_3(x)) = ?$$

$$= \partial_1 F(\cdot) \cdot \frac{dg_1}{dx} + \partial_2 F \cdot \frac{dg_2}{dx} + \partial_3 F \cdot \frac{dg_3}{dx}$$

$$\left(F(u, v, w) = \int_u^v h(w, t) dt \right)$$

$$= \underline{F_u} \cdot g'_1 + F_v \cdot g'_2 + F_w \cdot g'_3$$

$$F_u \stackrel{?}{=} \frac{d}{du} \int_u^{c_2} h(c_3, t) dt, \quad F_v \stackrel{?}{=} \frac{d}{dv} \int_{c_1}^v h(c_3, t) dt$$