

$$\frac{d}{dx} \int_0^{x^2} t + e^t dt$$

$$2x(x^2 + e^{x^2})$$

$$\frac{d}{dx} \int_0^x t + e^t dt = x + e^x$$

$$y = h(x) \\ \text{where } h(x) = \int_0^x t + e^t dt$$

$$\frac{dy}{dx} = x + e^x$$

Suppose Let $u = x^2$

$$h(x^2) = \int_0^{x^2} t + e^t dt$$

Do not look at this

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$y = f(x) \text{ then } \frac{d}{dx}(y) = \frac{dy}{dx}$$

$$y = f(u) \text{ then } \frac{d}{dx}(y) = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$\frac{d}{dx} \left[\int_0^{x^2} t + e^t dt \right] = \frac{d}{du} \left[\int_0^u t + e^t dt \right] \cdot \frac{du}{dx}$$

$$= (u + e^u) \cdot 2x$$

$$= (x^2 + e^{x^2}) 2x$$

$$h(g(x)) = \int_0^{g(x)} f(t) dt$$

Suppose c is in $[a, b]$

$$\text{Then } \int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$$

$$\int_a^b f(x) dx = - \int_b^a f(x) dx$$

$$\frac{d}{dx} \int_x^{x^2} \cos t \, dt$$

$$\frac{d}{dx} \left[\int_x^a \cos t \, dt + \int_a^{x^2} \cos t \, dt \right]$$

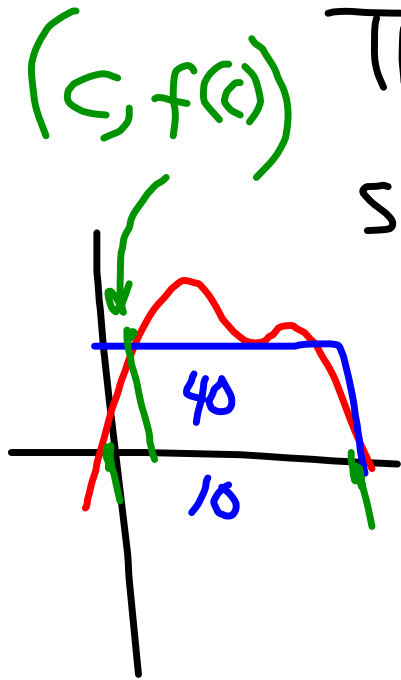
$$\frac{d}{dx} \left[\int_a^{x^2} \cos t \, dt - \int_a^x \cos t \, dt \right]$$

$$2x \cos x^2 - \cos x$$

MVT for Integrals

Suppose f is continuous on $[a, b]$

There is some c in $[a, b]$
such that



$$f(c) = \frac{1}{b-a} \int_a^b f(x) dx$$

