

Leibnitz' Rule

Let

$$F(x) = \int_{a(x)}^{b(x)} f(x, y) dy$$

where we assume

- ✓ $f(x, y)$ has continuous derivative with respect to x in some interval $[c, d]$
- ✓ $a(\cdot)$ and $b(\cdot)$ are differentiable

Then whenever x is in the interval $[c, d]$,

$$\frac{d}{dx} F(x) = \int_{a(x)}^{b(x)} \frac{\partial f(x, y)}{\partial x} dy + f(x, b(x)) \frac{d}{dx} b(x) - f(x, a(x)) \frac{d}{dx} a(x)$$