

# 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  $[c, d]$ ,

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