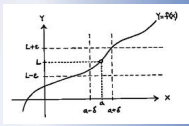
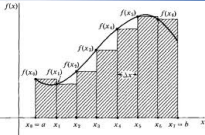


## 27 Second Fundamental Thm



$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$\frac{d}{dx} \int_a^x f(t) dt = f(x)$$



$$\lim_{\max \Delta x_i \rightarrow 0} \sum_{i=1}^n f(x_i) \Delta x_i = \int_a^b f(x) dx$$

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

# The Second Fundamental Theorem of Calculus

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

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

### Second Fundamental Theorem of Calculus

Let  $f$  be continuous on  $[a, b]$  and  $F$  be any antiderivative of  $f$  on  $[a, b]$ .

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

EX 1 
$$\int_{-1}^2 x^4 dx$$

EX 2 
$$\int_{\pi/6}^{\pi/2} 2 \sin t dt$$

## 27 Second Fundamental Thm

### Substitution Rule for Indefinite Integrals

Let  $g$  be differentiable and  $F$  be any antiderivative of  $f$ .

Then if  $u = g(x)$ ,

$$\int f(g(x))g'(x)dx = \int f(u)du = F(u) + C = F(g(x)) + C$$

$$\text{EX 3} \quad \int \sqrt{x^3+1}(3x^2)dx$$

$$\text{EX 4} \quad \int_0^{\pi/2} \sin^2(3x)\cos(3x)dx$$

$$\text{EX 5} \quad \int_1^3 \frac{x^2+1}{\sqrt{x^3+3x}}dx$$

$$\text{EX 6} \quad \int_{-4}^{-1} \frac{1-s^4}{2s^2}ds$$

## 27 Second Fundamental Thm

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

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