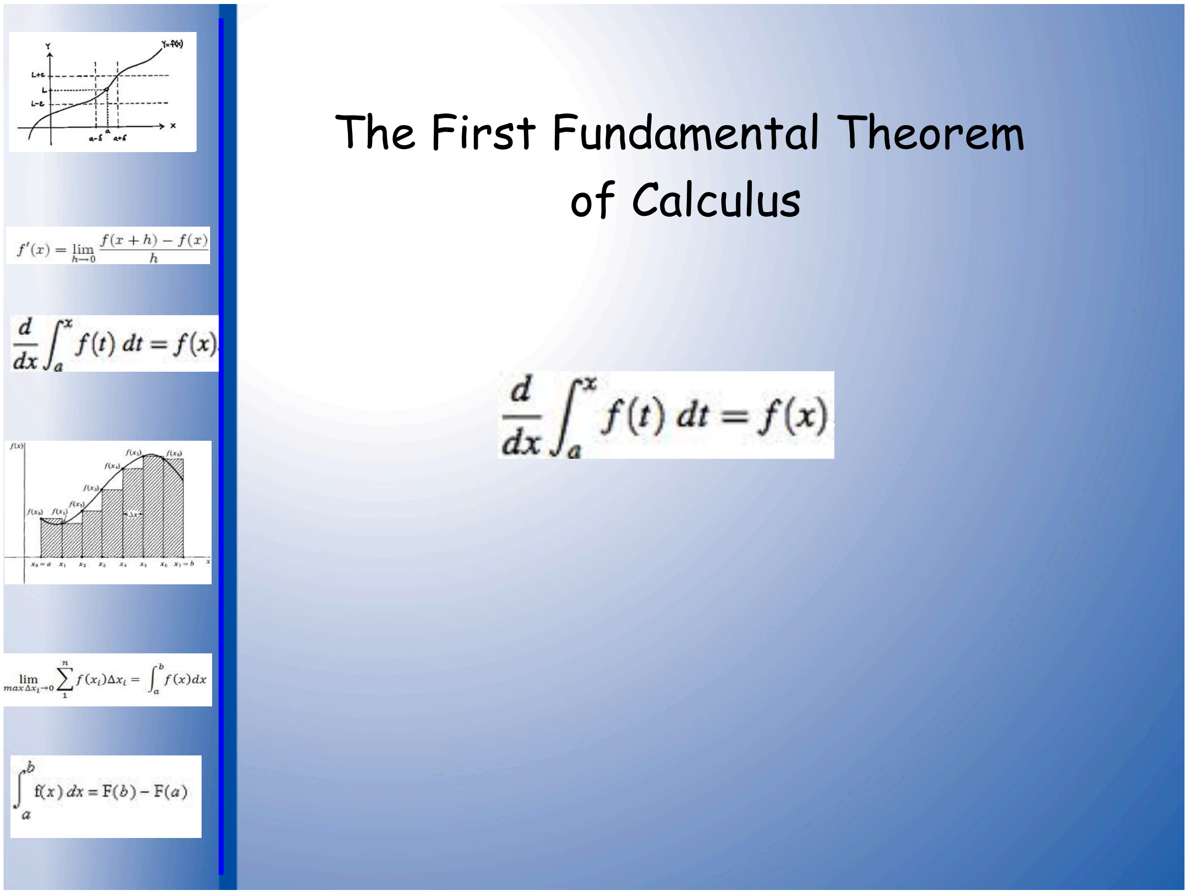


<u>The First Fundamental Theorem of Calculus</u>

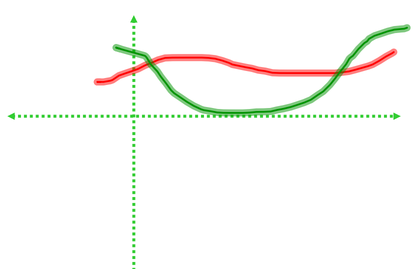
Let *f* be continuous on [a,b] and let *x* be a value in (a,b). Then

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

<u>Theorem Comparison Property</u>

If *f* and *g* are integrable on [a,b] and if *f(x)≤g(x)* for all *x* on [a,b],

then $\int_a^b f(x)dx \le \int_a^b g(x)dx$



<u>Theorem Boundless Property</u>

If f is integrable on [a,b] and *m≤f(x)≤M* for all a on [a,b],

then m(b-a)≤ $\int_a^b f(x)dx$ ≤M(b-a)

Theorem **Linearity of the Definite Integral**

If *f* and *g* are integrable on [a,b] and *k* is a real number, then

(i) $\int_a^b kf(x)dx = k\int_a^b f(x)dx$

and

(ii) $\int_a^b (f(x) \pm g(x))dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$

EX 1 Suppose $\int_0^1 f(x)dx = 2$ $\int_1^2 f(x)dx = 3$

$\int_0^1 g(x)dx = -1$ $\int_0^2 g(x)dx = 4$

Calculate $\int_0^2 (\sqrt{3}f(t) + \sqrt{2}g(t) + \pi)dt$.

EX 2 Find *G'(x)* for each of these.

a) *G(x)* = $\int_3^x 4t\,dt$

b) *G(x)* = $\int_1^x (\cos^3(2t)\tan(t))dt \qquad -\pi/2 < x < \pi/2$

c) *G(x)* = $\int_{-2}^x (xt)dt$

EX 3 Find $\frac{d}{dx}\int_{1}^{x^2+x}\sqrt{2w+\sin w}\,dw$

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