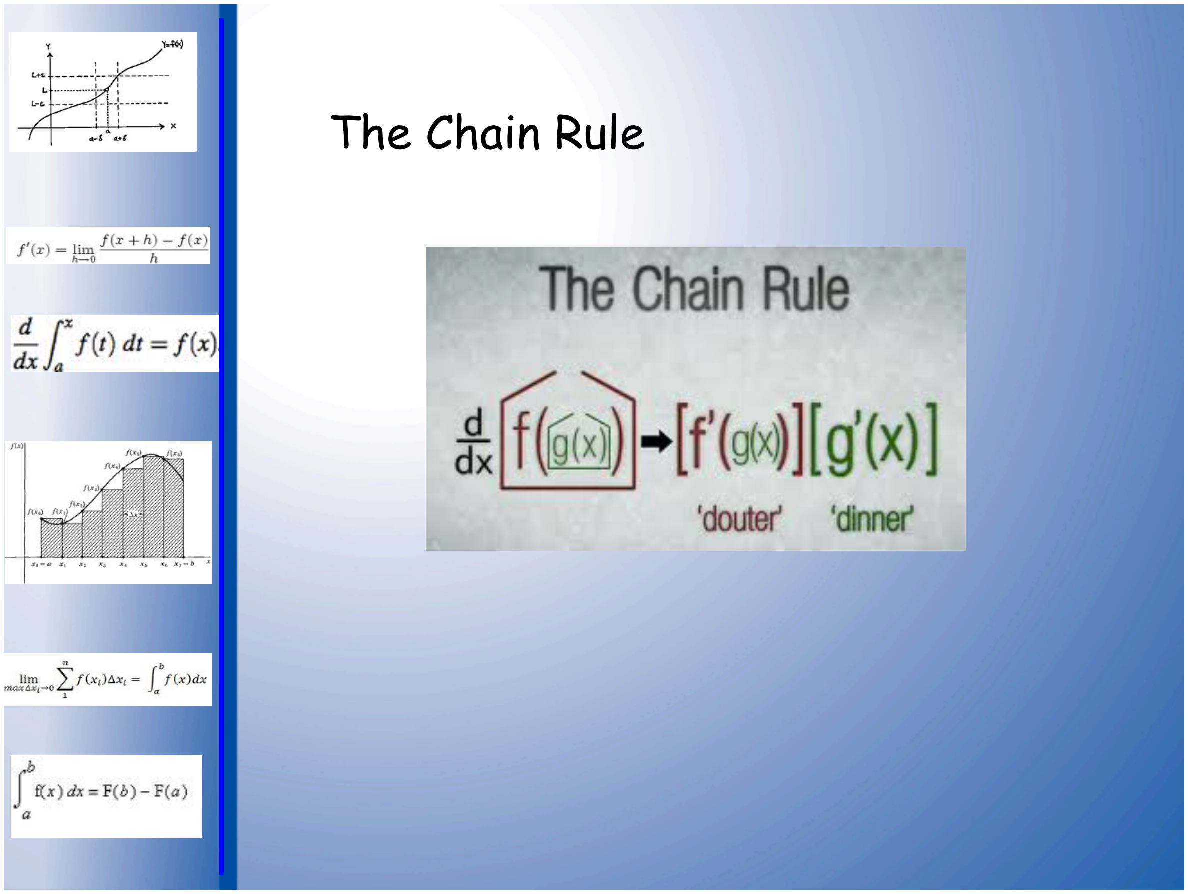

<u>The Chain Rule</u>

$$D_x\left(f\left(g(x)\right)\right) = f'\left(g(x)\right)(g'(x)) \qquad \text{or} \qquad D_x y = (D_u y)(D_x u)$$

Basically, we differentiate from the 'outside-in.' This is very useful if we need to differentiate something like $f(x) = 3(x^2-2x+1)^{80}$ and you really don't want to multiply it out.

EX 1 If $y=\left(3x^3-4x+5\right)^{10}$ find y'

EX 2 If $y=\dfrac{4}{\left(2x^7-6x^2\right)^5}$ find y'

12 Chain Rule

Ex 3 Find *f′(x)*:

a) $f(x) = \sin^2 x$

b) $f(x) = \sin(x^3)$

EX 3 (continued) Find *f′(x)*:

c) $f(x) = \left(\dfrac{2x+1}{x-5}\right)^4$

d) $f(x) = \sin^2(4x)\left(2x^5 - 3\right)^3$

12 Chain Rule

We can think of the chain rule as $\frac{dy}{dx} = \frac{dy}{du}\frac{du}{dx}$

EX 4 Find $\frac{dy}{dx}$

a) $y = \left[\left(2x^2 + 3\right)cos\left(x\right)\right]^4$

b) $y = \left(-3x + \frac{5}{x}\right)^{-4}$