§ 3.6 Chain Rule.

The Chain Rule:

If f, g are both diff. and $F = f \circ g$ (i.e. $F(x) = f(g(x))$ then F is diff, and

$$F'(x) = f'(g(x))\, g'(x)$$

Leibnitz notation:

Let $y = f(u)$ and $u = g(x)$.

Then

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

eg.: Let $f(x) = \sqrt{x^3 + 2x}$

Compute $f'(x)$.

*eg. $f(x) = \cos(x^2+5)$

$f'(x) =$

- Power Rule Combined w/ the Chain Rule:

$\forall\ n \in \mathbb{R}$; $u = g(x)$ is diff.

Then,

$$\frac{d}{dx}(u^n) = n u^{n-1} \frac{du}{dx}$$

OR

$$\frac{d}{dx}(g(x)^n) = n g(x)^{n-1} g'(x)$$

- eg. $f(x) = (x^2+3x+2)^{1000}$

$f'(x) =$

*eg.: $f(x) = \sin((x+2)^{100}) / \cos(x)$

*eg. $f(t) = \sqrt{\frac{t+5}{2t+17}}$

$f'(t) =$

*eg. $f(x) = (x^2+2x)^{1000}(x^{17}+4)^{500}$

$f'(x) =$