MATH 121

CHAIN RULE

GOALS

- ☐ DIFFERENTIATE COMPOSITIONS OF FUNCTIONS USING THE CHAIN RULE
  - ☐ EXTEND TO COMPOSITIONS OF THREE OR MORE FUNCTIONS
- ☐ USE THE CHAIN RULE IN CONJUNCTION WITH OTHER RULES FOR COMBINING DERIVATIVES: CONSTANT MULTIPLE, SUM/DIFFERENCE, PRODUCT, AND QUOTIENT

WARM UP

COMPUTE THE DERIVATIVE OF EACH FUNCTION

1. $f(x) = 6\sqrt[3]{x^2}$

2. $g(x) = 3x^4 \sec(x)$

3. $h(x) = \dfrac{4x^2 + x - 3}{x^2}$

CHAIN RULE

ALLOWS US TO DIFFERENTIATE **COMPOSITIONS OF FUNCTIONS**.

$$\frac{d}{dx}\left(f(g(x))\right) = f'(g(x)) \cdot g'(x)$$

EX: $y = \sin(3x^4)$

EX: $y = 2(x^3+1)^5$

Ex: $y = \sec(5x^4)$

Ex: $y = \tan^4(x)$

Ex: $y = \tan^4(x^2+1)$

Try

① $y = \cos(5x^4 + x)$

② $y = \sqrt{6x^2+1}$

③ $y = \sec^2(3x+1)$

TRY

① $y = x^4 \sin(x^2+1)$

② $y = \dfrac{5}{(x^3+4)^4}$

③ $y = \csc^3(5x-1)$