

# MA 16020 LESSON 20: HIGHER ORDER PARTIAL DERIVATIVES (CALCULUS I REVIEW)

*NOTE: LESSON 20 WILL NOT BE ON EXAM 2!!!*

## DERIVATIVES FORMULAS

- Product Rule: If  $y = u(x)v(x)$ , then

$$y' = u'(x)v(x) + u(x)v'(x)$$

- Quotient Rule: If  $y = \frac{u(x)}{v(x)}$ , then

$$y' = \frac{u'(x)v(x) - u(x)v'(x)}{v^2(x)}$$

- Chain Rule: If  $y = f(g(x))$ , then

$$y' = f'(g(x)) \cdot g'(x)$$

## HIGHER ORDER DERIVATIVES

Recall the derivative of a function  $y = f(x)$  is  $y' = f'(x)$ . So, the derivative of the derivative is  $y'' = f''(x)$ . And so on...

**Exercise 1:** Find the second derivative of the following:

1.  $y = 9x^2 + 5y^5$

7.  $y = 13 \ln(x)$

2.  $y = 6x + e^{2x}$

8.  $y = \frac{12y}{15y^3 - 1}$

3.  $y = 10xe^{x^2}$

9.  $y = 9x \ln(8x)$

4.  $y = xe^{5x}$

10.  $y = \frac{\ln(8x)}{5y}$

5.  $y = 3x \ln(8x) + 7x^2$

11.  $y = \ln(6x^2)$

6.  $y = 7 \sin(x)$

12.  $y = 10e^{\cos(5x-3)}$