



March 30 – April 3, 2020

Topic: Differentiation Rules for Algebraic Functions and Chain Rule (continuation)

- I. Directions: On a yellow paper, differentiate each given function using the long method (delta method) and using the differentiation rules. Show your complete solutions.

Example: $y = 3x^2 - 5x$

Solution:

- a. using the long method or the delta method

$$\begin{aligned} Y &= 3x^2 - 5x \\ Y + \Delta y &= 3(x + \Delta x)^2 - 5(x + \Delta x) \\ Y + \Delta y - Y &= 3(x^2 + 2x\Delta x + \Delta x^2) - 5x - 5\Delta x - (3x^2 - 5x) \\ \Delta y &= 3x^2 + 6x\Delta x + 3\Delta x^2 - 5x - 5\Delta x - 3x^2 + 5x \\ &= 6x\Delta x + 3\Delta x^2 - 5\Delta x \\ \frac{\Delta y}{\Delta x} &= 6x + 3\Delta x - 5 \\ \lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x} &= \lim_{\Delta x \rightarrow 0} (6x + 3\Delta x - 5) \quad ; \text{ as } \Delta x \text{ approaches } 0 \\ \frac{dy}{dx} &= 6x - 5 \end{aligned}$$

- b. using the differentiation rule

$$\begin{aligned} Y &= 3x^2 - 5x \\ \frac{dy}{dx} &= \frac{d}{dx} (3x^2) - \frac{d}{dx} (5x) \\ &= 2(3)x^{2-1} - 5 \\ &= 6x - 5 \\ \frac{dy}{dx} &= 6x - 5 \end{aligned}$$

1. $y = 5x - 4$

6. $f(x) = 2 - 3x + 7x^2$

2. $y = 3x^2 + 5x - 7$

7. $f(x) = 5x^3 - 1$

3. $y = (x^2 + 3)(x - 4)$

8. $f(x) = (9x - 1)(x + 9)$

4. $y = (2x - 9) / (6x + 5)$

9. $13x - 2 / (4x + 3)$

5. $y = \sqrt{2 - 3x}$

10. $2 / \sqrt{x+1}$



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II. Directions: Determine the derivatives of each given function using the differentiation rule and the chain rule. Show your complete solutions. (Note: Write your answers on a bond paper)

1. $f(x) = (3x^2 + 1)(x - 3)$

2. $f(x) = (5x - 2)^3$

3. $f(x) = (2x^2 + x - 1)(x^2 - 3x + 2)$

4. $f(x) = (x^2 + 3) / (3x + 2)$

5. $f(x) = (x^2 - 5x + 1) / (x - 5)$

6. $f(x) = (3x - 2) / (3x^2 + 4x - 5)$

7. $f(x) = (3x + 4)^5$

8. $f(x) = (2x^2 + x - 3)^{1/2}$

9. $f(x) = (5x^2 - 4)^{1/3}$

10. $f(x) = (4x^2 - 3)^{-2}$