

[MODULE 5: PRODUCT, QUOTIENT, RATES OF CHANGES, AND HIGHER DERIVATIVES ALL IN A MIX]

New York City College of Technology
MAT 1475 PAL Workshops

Name: _____

Points: _____

1. **Reading assignment:** For a practical application of the product rule of derivatives see the following link. Computing the speed of model rockets with the product rule.
https://en.wikibooks.org/wiki/Calculus/Product_and_Quotient_Rules

2. State and use the Product Rule to calculate the derivative

$$\left. \frac{df}{dx} \right|_{x=9}, f(x) = (x^{\sqrt{2}} - \sqrt{x} + 1)(x^{-2} - 3x - 1)$$

3. State and use the Quotient Rule to calculate the derivative $\left. \frac{df}{dx} \right|_{x=1}$, $f(x) = \frac{5x^2 - \sqrt{x} - 2}{4x^3 + 1}$

4. Find the rate of change of the Volume V of a cylinder with respect to its radius if the height is twice the radius.

5. Find the rate of change of the fifth root $\sqrt[5]{x}$ with respect x when $x = 1, 32$ and 243 .

6. Find the n -th derivative of the function $f(x) = x^k$, for the following three cases: $k < n$, $k = n$ and $k > n$. Assume that k is a positive integer. The answers for the three cases are: 0 , $n!$ and $\frac{k!}{(k-n)!}x^{k-n}$ respectively. It is best if you pick appropriate values for n and k to see each case.