

Let's Explore how to differentiate the product of two functions!

1. Let $g(x) = x^7$ and let $h(x) = x^{11}$.

Find $g'(x)$.

Find $h'(x)$.

2. Let $f(x) = g(x) \cdot h(x)$. Write an equation for $f(x)$ as a single power of x . $f(x) =$ _____

Find $f'(x)$.

3. True or False? $f'(x) = g'(x) \cdot h'(x)$ Show work to support your answer.

Product Rule

If f and g are differentiable at x , then

$$\frac{d}{dx}(f(x)g(x)) = f'(x)g(x) + g'(x)f(x)$$

Find and simplify the following derivatives.

1. $\frac{d}{dv}(v^2(2\sqrt{v}+1))$

2. $\frac{d}{dx}(x^2e^x)$

Quotient Rule

If f and g are differentiable at x , then

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - g'(x)f(x)}{(g(x))^2}$$

Find and simplify the following derivatives.

3. $\frac{d}{dx}\left(\frac{x^2 + 3x + 4}{x^2 - 1}\right)$

4. $\frac{d}{dx}(e^{-x})$

5. Find the equation of the line tangent to the graph of $f(x) = \frac{x^2 + 1}{x^2 - 4}$ at the point (3, 2).

Find the following derivatives.

$$6. \frac{d}{dz}(\sqrt[3]{z}e^z)$$

$$7. \frac{d}{dx}\left(\frac{3x^{\frac{5}{2}}}{2x^2+4}\right)$$

$$8. y = \frac{4xe^x}{x^2+1}$$