

Derivative Rule Mix

Use the right rule for each function.

HIGH SCHOOL • MA.912.C.2.4

MA.912.C.2.4 "Apply the rules for finding derivatives of constants, sums, products, quotients and the Chain Rule to solve problems with functions limited to algebraic, trigonometric, inverse trigonometric, logarithmic and exponential."

NAME _____

DATE _____

CHOOSE THE RULE

Differentiate each term in a sum, and remember that the derivative of a constant is zero. Use the product rule or quotient rule when two changing expressions are multiplied or divided. Use the Chain Rule when one function is inside another function.

WORKED EXAMPLE

Find $f'(x)$ if $f(x) = (11x + 13)e^x$.

1. Use the product rule: $f'(x) = 11e^x + (11x + 13)e^x$.
2. Factor out e^x : $f'(x) = e^x(11 + 11x + 13)$.
3. Combine constants: $f'(x) = e^x(11x + 24)$.

Answer: $f'(x) = e^x(11x + 24)$

PRACTICE 6 problems

1 Find $d/dx [7x^5 - 9x^2 + 8]$.

ANSWER _____

2 Find $d/dx [(x^3 + 4)\sin x]$.

ANSWER _____

3 Find $d/dx [(\ln x)/x^2]$.

ANSWER _____

4 Find $d/dx [\arctan(3x - 1)]$.

ANSWER _____

5 Find $d/dx [e^{(4x^2)}]$.

ANSWER _____

6 Find $d/dx [(\cos(5x))/x]$.

ANSWER _____

APPLY IT Show your work

- 1** A student streams a gaming tournament. The number of views, in thousands, after t hours is modeled by $V(t) = (t^2 + 6)e^t$. Find the instantaneous rate of change in views when $t = 1$.

WORK SPACE

ANSWER _____

- 2** A student designs a racing game. The camera angle is $A(t) = \arctan(2t + 1)$ radians, where t is time in seconds. Find how fast the angle is changing when $t = 1$.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Find $\frac{d}{dx} \left[\frac{(x^2 + 3)e^{2x}}{(x - 4)} \right]$.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Find $d/dx [7x^5 - 9x^2 + 8]$.	$35x^4 - 18x$
2	Find $d/dx [(x^3 + 4)\sin x]$.	$3x^2 \sin x + (x^3 + 4)\cos x$
3	Find $d/dx [(\ln x)/x^2]$.	$(1 - 2\ln x)/x^3$
4	Find $d/dx [\arctan(3x - 1)]$.	$3/(1 + (3x - 1)^2)$
5	Find $d/dx [e^{(4x^2)}]$.	$8x e^{(4x^2)}$
6	Find $d/dx [(\cos(5x))/x]$.	$(-5x \sin(5x) - \cos(5x))/x^2$

PART 2 • APPLY IT

- 9e thousand views per hour** Differentiate with the product rule: $V'(t) = e^t(t^2 + 2t + 6)$. Substitute $t = 1$ to get $V'(1) = 9e$.
- 1/5 radian per second** Use the Chain Rule: $A'(t) = 2/(1 + (2t + 1)^2)$. Substitute $t = 1$ to get $A'(1) = 1/5$.

CHALLENGE

$$e^{(2x)}(2x^3 - 7x^2 - 2x - 27)/(x - 4)^2$$

Accept equivalent expanded or factored forms. For quotient-rule answers, accept any algebraically equivalent expression with the correct domain restrictions.