LESSON MAKER PRO

Derivative Decisions

Choose the rule that fits each function.

HIGH SCHOOL · C.A.11

C.A.11 "Apply differentiation rules to sums, products, quotients, and powers of functions."

NAME _____ DATE _____

CHOOSE A RULE

Differentiate each term in a sum, and use $(x^n)' = nx^{n-1}$. For a product uv, use (uv)' = u'v + uv'; for a quotient u/v, use $(u/v)' = (u'v - uv')/v^2$. For a power $[u(x)]^n$, multiply $n[u(x)]^{n-1}$ by u'(x).

WORKED EXAMPLE

Differentiate $y = (7x^4 + 9)(x^6 - 11)$.

1. Let $u = 7x^4 + 9$ and $v = x^6 - 11$.
2. Then $u' = 28x^3$ and $v' = 6x^5$.
3. Use the product rule: $y' = 28x^3(x^6 - 11) + (7x^4 + 9)6x^5$.

Answer: $y' = 70x^9 + 54x^5 - 308x^3$

PRACTICE 6 problems

1 Differentiate $y = 3x^5 + 2x^2 - 8$.

ANSWER _____

2 Differentiate $y = (x^3 + 5)(2x - 3)$.

ANSWER _____

3 Differentiate $y = (5x^2 - 3)/(x + 2)$.

ANSWER _____

4 Differentiate $y = (2x^3 - 5)^2$.

ANSWER _____

5 Differentiate $y = (3x^2 + 2)(x^3 - 5)$.

ANSWER _____

6 Differentiate $y = (x^3 + 2)/(2x - 5)$.

ANSWER _____

APPLY IT Show your work

1 At x days into a fundraiser, a club predicts it will sell $x^2 + 3$ stickers on day x and make $2x + 5$ dollars per sticker. Write its predicted profit P(x) for day x. Then find P'(2) and state its units.

WORK SPACE

ANSWER _____

2 A phone's battery level x hours after plugging it in is $B(x) = (80x + 20)/(x + 2)$ percent, for $x \geq 0$. Find B'(2) and explain what it means.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Differentiate $F(x) = (x^2 + 3)^2/(x + 5)$. Write your answer as one fraction.

WORK SPACE AND ANSWER

Derivative Decisions

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Differentiate $y = 3x^5 + 2x^2 - 8$.	**$y' = 15x^4 + 4x$**
2	Differentiate $y = (x^3 + 5)(2x - 3)$.	**$y' = 8x^3 - 9x^2 + 10$**
3	Differentiate $y = (5x^2 - 3)/(x + 2)$.	**$y' = (5x^2 + 20x + 3)/(x + 2)^2$**
4	Differentiate $y = (2x^3 - 5)^2$.	**$y' = 12x^2(2x^3 - 5)$**
5	Differentiate $y = (3x^2 + 2)(x^3 - 5)$.	**$y' = 15x^4 + 6x^2 - 30x$**
6	Differentiate $y = (x^3 + 2)/(2x - 5)$.	**$y' = (4x^3 - 15x^2 - 4)/(2x - 5)^2$**

PART 2 · APPLY IT

1. **$P(x) = (x^2 + 3)(2x + 5)$; $P'(2) = 50$ dollars per day.** Use the product rule: $P'(x) = 2x(2x + 5) + 2(x^2 + 3)$. Substituting $x = 2$ gives 50.
2. **$B'(2) = 35/4$ percentage points per hour. After 2 hours, the battery level is increasing at 35/4 percentage points per hour.** The quotient rule gives $B'(x) = [80(x + 2) - (80x + 20)]/(x + 2)^2 = 140/(x + 2)^2$. At $x = 2$, this is $140/16 = 35/4$.

CHALLENGE

$F'(x) = (x^2 + 3)(3x^2 + 20x - 3)/(x + 5)^2$

Accept equivalent factored or expanded derivatives. For quotient answers, the original denominator must be nonzero.