HW 9.7 (part 2)

1. $y = x^2\sqrt[4]{4x-9}$

$y = x^2(4x-9)^{1/4}$ ← REWROTE ROOT

THEN IDENTIFY → PRODUCT = F·S YES!

QUOTIENT = $\frac{N}{D}$ NO

CHAIN = $(\quad)^{1/4}$ NO

↑ NOT ATTACHED TO THE x^2

PRODUCT RULE WITH $\begin{cases} F = x^2 \\ S = (4x-9)^{1/4} \end{cases}$

$$y' = \underbrace{x^2}_{F} \cdot \underbrace{\tfrac{1}{4}(4x-9)^{-3/4}\cdot 4}_{S'} + \underbrace{2x}_{F'} \cdot \underbrace{(4x-9)^{1/4}}_{S}$$

CORRECT ANSWER, BUT WE WANT YOU TO SIMPLIFY CONSTANTS & REWRITE NEGATIVE EXPONENTS AS FOLLOW

NOTE: $\frac{1}{4}\cdot 4 = 1$

$(4x-9)^{-3/4} = \frac{1}{(4x-9)^{3/4}}$

FINAL ANSWER:

$$y' = \frac{x^2}{(4x-9)^{3/4}} + 2x(4x-9)^{1/4}$$

HW 9.7 (part 1)

5 $y = \frac{4}{3}x^3(4x^5-5)^3$

PRODUCT, QUOTIENT, or CHAIN?

$F = \frac{4}{3}x^3 \qquad F' = 4x^2$

$S = (4x^5-5)^3 \qquad S' = 3(4x^5-5)^2 \cdot 20x^4$ ← CHAIN

$y' = \underbrace{F}\cdot\underbrace{S'} + \underbrace{F'}\cdot\underbrace{S}$

$y' = \frac{4}{3}x^3 \cdot 3(4x^5-5)^2 \cdot 20x^4 + 4x^2(4x^5-5)^3$

CORRECT ANSWER, NOW SIMPLIFY TERMS & TRY TO FACTOR. REGROUPING:

TERM 1: $\frac{4}{3}\cdot 3\cdot 20\cdot x^3\cdot x^4(4x^5-5)^2 = 80x^7(4x^5-5)^2$

ALL TOGETHER

$y' = 80x^7(4x^5-5)^2 + 4x^2(4x^5-5)^3$

WHAT DO THESE HAVE IN COMMON?

THIS → $4x^2(4x^5-5)^2$

FACTORING OUT GIVES

$4x^2(4x^5-5)^2(20x^5+(4x^5-5)^1)$

FINAL ANSWER

$y' = 4x^2(4x^5-5)^2(24x^5-5)$

HW 9.7 (PART 1)

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

PRODUCT, QUOTIENT, OR CHAIN?

$F = (x-7)^2$ $\quad F' = 2(x-7)(1)$ ← CHAIN RULE HERE

$S = (x^2+3)$ $\quad S' = 2x$

$$y' = \underbrace{F}_{(x-7)^2} \cdot \underbrace{S'}_{2x} + \underbrace{F'}_{2(x-7)} \cdot \underbrace{S}_{(x^2+3)}$$

CORRECT ANSWER, BUT SYSTEM WANTS YOU TO TRY TO FACTOR.

NOTICE THAT BOTH TERMS CONTAIN $2(x-7)$. LET'S FACTOR ONE $2(x-7)$ OUT OF EACH WHICH GIVES

$$y' = 2(x-7)\left(\underbrace{(x-7)\cdot x + (x^2+3)}_{\text{SIMPLIFIES TO } x^2-7x+x^2+3} \right)$$

FINAL ANSWER:

$$\boxed{y' = 2(x-7)(2x^2-7x+3)}$$

HW 9.7 (part 1)

7 $y = \dfrac{(x^2-3)^3}{x^2+2}$

PRODUCT, QUOTIENT, or CHAIN?

chain rule

$N = (x^2-3)^3$ $\quad N' = 3(x^2-3)^2 \cdot 2x$

$D = x^2+2$ $\quad D' = 2x$

$$y' = \frac{DN' - ND'}{D^2} = \frac{(x^2+2)\cdot 3(x^2-3)^2\cdot 2x - (x^2-3)^3\cdot 2x}{(x^2+2)^2}$$

CORRECT ANSWER, BUT LET'S PRACTICE SIMPLIFYING.

NOTE: $(x^2+2)\cdot 3\cdot (x^2-3)^2\cdot 2x = 6x(x^2+2)(x^2-3)^2$

NOW LOOK AT THE NUMERATOR OF OUR ANSWER. CAN WE FACTOR? YES

$$6x(x^2+2)(x^2-3)^2 - 2x(x^2-3)^3$$

THEY HAVE $2x(x^2-3)^2$ IN COMMON. FACTORING GIVES

$$2x(x^2-3)^2\big(\underbrace{3(x^2+2) - (x^2-3)}_{3x^2+6-x^2+3}\big)$$

$$2x^2+9$$

FINAL ANSWER:

$$y' = \frac{2x(x^2-3)^2(2x^2+9)}{(x^2+2)^2}$$