Warm Up

Differentiate each of the following:

1. $y = 3x^3 - \frac{5}{x^2} + \sqrt{x} - 3x^{\frac{3}{5}} + \pi^4$

2. $f(x) = \left(8\sqrt{x} - x^5 + 2\right)\left(7 - x^{-5}\right)$

3. $h(t) = \frac{7t^6 - 3t^4 + \sqrt[3]{t^7}}{8t - 5}$

4. $g(x) = \left[x^5 - (2x+8)^7\right]^{25}$

$$\left[f(x)\right]^n$$

$$n\left[f(x)\right]^{n-1} \cdot f'(x)$$

1. $y = 3x^3 - \frac{5}{x^2} + \sqrt{x} - 3x^{\frac{3}{5}} + \pi^4$

$y' = 9x^2 + 10x^{-3} + \frac{1}{2}x^{-\frac{1}{2}} - \frac{9}{5}x^{-\frac{2}{5}}$

2. $f(x) = \left(8\sqrt{x} - x^5 + 2\right)\left(7 - x^{-5}\right)$

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$y' = \left(4x^{-\frac{1}{2}} - 5x^4\right)\left(7 - x^{-5}\right) + \left(8\sqrt{x} - x^5 + 2\right)\left(5x^{-6}\right)$

3. $h(t) = \dfrac{7t^6 - 3t^4 + \sqrt[3]{t^7}}{8t - 5}$

$h'(t) = \dfrac{\left(42t^5 - 12t^3 + \frac{7}{3}t^{\frac{4}{3}}\right)(8t-5) - \left(7t^6 - 3t^4 + t^{\frac{7}{3}}\right)(8)}{(8t-5)^2}$

4. $g(x) = \left[x^5 - (2x+8)^7\right]^{25}$

$[B]^n$

$n[B]^{n-1}(B)'$

$g'(x) = 25\left[x^5 - (2x+8)^7\right]^{24}\left[5x^4 - 7(2x+8)^6(2)\right]$

$$f(x)=\sqrt[4]{\frac{\left(x^5-1\right)^{-2}+3x^7}{x\sqrt{3x-5}}}$$

$(BLOB)^{\frac{1}{4}}$

$$f'(x)=\frac{1}{4}\left[\frac{(x^5-1)^{-2}+3x^7}{x(3x-5)^{1/2}}\right]^{-3/4}\left[\frac{(-2(x^5-1)^{-3}(5x^4)+21x^6)\times(3x-5)^{1/2}-((x^5-1)^{-2}+3x^7)\left[(1)(3x-5)^{1/2}+x\left(\frac{1}{2}(3x-5)^{-1/2}(3)\right)\right]}{(x(3x-5)^{1/2})^2}\right]$$

$$y=\left(x^4+5x\sqrt{x+\sqrt[3]{x^3+8}}\right)^4$$

$$y = \left(x^4 + 5x\sqrt{x + \sqrt[3]{x^3 + 8}} \right)^4$$

$$y = \left[x^4 + 5x\left[x + (x^3+8)^{1/3}\right]^{1/2} \right]^4$$

$$y' = 4\left[x^4 + 5x\left[x + (x^3+8)^{1/3}\right]^{1/2}\right]^3 \left[4x^3 + 5\left[x + (x^3+8)^{1/3}\right]^{1/2} + 5x\left[\frac{1}{2}\left[x + (x^3+8)^{1/3}\right]^{-1/2}\left(1 + \frac{1}{3}(x^3+8)^{-2/3}(3x^2)\right)\right]\right]$$

$$\frac{7}{5x^3} = 3\cancel{5}x^{-3}$$

$$7(5)^{-1}x^3$$

$$= 7(5x^3)^{-1}$$

$$\frac{7}{5}x^{-3}$$

$$\underbrace{7x}_{f(x)}\underbrace{(x^3-5)^8}_{g(x)} \neq 7(x^3-5)^8$$

$$7(x^3-5)^8 + 7x\left(8(x^3-5)^7(3x^2)\right)$$

$$56(x^3-5)^7(3x^2)$$

Complete practice sheet using derivative Rules.