WARM UP

Find $f'(x)$

1) $f(x) = 5e^x - 7x^2 + 8e^{\pi}$ $\quad f'(x) = 5e^x - 14x$

2) $f(x) = 5 \cdot 3^x$ $\quad f'(x) = 5 \cdot 3^x (\ln 3)$

3) $f(x) = (6x-1)(7x+5) = 42x^2 + 23x - 5$

$f'(x) = 84x + 23$

Section 3.3 The Product and Quotient Rules

PRODUCT RULE: $\frac{d}{dx}\left[f(x) \cdot g(x)\right] = f(x) \cdot g'(x) + g(x) \cdot f'(x)$

1st 2nd — 1st. deriv of 2nd + 2nd. deriv of 1st

ex: $f(x) = (6x-1)(7x+5)$

1st 2nd

$f'(x) = (6x-1) \cdot 7 + (7x+5) \cdot 6$

$f'(x) = 42x - 7 + 42x + 30$

$f'(x) = 84x + 23$

ex: $f(x) = \underbrace{x^2}_{1^{st}} \underbrace{e^x}_{2^{nd}}$

$f'(x) = x^2 \cdot e^x + e^x \cdot 2x$

$f'(x) = xe^x(x+2)$

ex: $f(x) = (x^2 + \sqrt{x})(x^2 - \sqrt{x})$

$f(x) = x^4 - x$

$f'(x) = 4x^3 - 1$

The Quotient Rule

$$\frac{d}{dx}\left[\frac{\overbrace{f(x)}^{TOP}}{\underbrace{g(x)}_{BOT}}\right] = \frac{g(x)\cdot f'(x) - f(x)\cdot g'(x)}{[g(x)]^2}$$

$$= \frac{BOT \cdot der\ TOP - TOP \cdot der\ BOT}{BOT^2}$$

ex: $g(x) = \frac{25x^2}{e^x}$ TOP / BOT

$$g'(x) = \frac{e^x \cdot 50x - 25x^2 \cdot e^x}{(e^x)^2}$$

GCF $= 25xe^x$

$$g'(x) = \frac{25xe^x(2-x)}{(e^x)^2}$$

$$g'(x) = \frac{25x(2-x)}{e^x}$$

ex: $y = \frac{x^2+5x+2}{x+3}$

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

$$y' = \frac{2x^2+11x+15-x^2-5x-2}{(x+3)^2}$$

$$y' = \frac{x^2+6x+13}{(x+3)^2}$$

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3, 4, 9, 10, 13, 14, 27, 29

9) $y = (t^3-7t^2+1)e^t$

$$y' = (t^3-7t^2+1)e^t + e^t(3t^2-14t)$$

$$y' = e^t(t^3-7t^2+1+3t^2-14t)$$

$$y' = e^t(t^3-4t^2-14t+1)$$