LOGS AND EXPONENTS

Note Title 3/29/2019

GIVEN $f(x) = e^x$ FIND $f'(x)$ (DEF$\overline{\text{N}}$ OF DERIVATIVE)

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$f'(x) = \lim_{h \to 0} \frac{e^{x+h} - e^x}{h}$$

$$f'(x) = \lim_{h \to 0} \frac{e^x(e^h - 1)}{h}$$

$$f'(x) = e^x \lim_{h \to 0} \frac{e^h - 1}{h}$$

$(* \ e^h \approx 1 + h)$

$$f'(x) = e^x \lim_{h \to 0} \frac{1 + h - 1}{h}$$

$$f'(x) = e^x \lim_{h \to 0} \frac{h}{h}$$

$$f'(x) = e^x \cdot 1$$

$$f'(x) = e^x$$

IX ① Find $f'(x)$ if $f(x) = x^2 \cdot e^x$

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

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

② $$f(x) = \frac{e^x + 2x^3}{4x}$$

$$f'(x) = \frac{(e^x + 6x^2)4x - 4(e^x + 2x^3)}{16x^2}$$

$(4x)^2 = 16x^2$

$$f'(x) = \frac{4xe^{x} + 24x^{3} - 4e^{x} - 8x^{3}}{16x^{2}}$$

$$f'(x) = \frac{4xe^{x} - 4e^{x} + 16x^{3}}{16x^{2}}$$

$$f'(x) = \frac{\cancel{4}\,(xe^{x} - e^{x} + 4x^{3})}{4\,\cancel{16}\,x^{2}}$$

$$f'(x) = \frac{xe^{x} - e^{x} + 4x^{3}}{4x^{2}}$$

(3) $f(x) = (2x^{3} + e^{x})^{4}$

$$f'(x) = 4(2x^{3} + e^{x})^{3}(6x^{2} + e^{x})$$

$$\frac{d}{dx} e^{f(x)} = e^{f(x)} \cdot f'(x)$$

$$e^{STUFF} = e^{STUFF} \cdot STUFF'$$

$\underline{\text{IE}}$ FIND $\frac{d}{dx} e^{2x+3} = e^{2x+3} \cdot 2 = 2e^{2x+3}$

$$\frac{d}{dx} e^{4x^2+9} = e^{4x^2+9} \cdot 8x$$

$$\frac{d}{dx} = e^{4x+6} \cdot e^{2x+9} = \frac{d}{dx} e^{6x+15} = e^{6x+15} \cdot 6$$

$$\frac{d}{dx} e^{\sqrt{x}} = \frac{d}{dx} e^{x^{\frac{1}{2}}} = e^{x^{\frac{1}{2}}} \cdot \frac{1}{2} x^{-\frac{1}{2}} \quad \frac{e^{\sqrt{x}}}{2x^{\frac{1}{2}}}$$

$$= \frac{e^{\sqrt{x}}}{2\sqrt{x}}$$

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#7, 9, 17, 19, 21, 25,

27, 42, 46, 49, 55