Derivatives of Exp. Fcns

$$\frac{d}{dx} a^u = a^u \ln a \frac{du}{dx} \quad \text{where } a > 0, a \neq 1$$

$$\frac{d}{dx} \ln u = \frac{1}{u} \frac{du}{dx} \qquad\qquad \frac{d}{dx} e^x = e^x$$

$$\frac{d}{dx} \log_a u = \frac{1}{u \ln a} \frac{du}{dx} \qquad \frac{d}{dx} e^u = e^u \frac{du}{dx}$$

ex.1 Differentiate.

a) e^{2x}

$$\frac{d}{dx} e^{2x} = e^{2x} \cdot 2$$
$$= 2e^{2x}$$

Hi everyone. I hope you have an awesome day!

b) e^{x^3}

$$\frac{d}{dx} e^{x^3} = e^{x^3} \cdot 3x^2$$
$$= 3x^2 e^{x^3}$$

c) e^{3x-1}

$$\frac{d}{dx} e^{3x-1} = 3e^{3x-1}$$

d) 3^x

$$\frac{d}{dx} 3^x = 3^x \ln 3 \cdot 1$$
$$= 3^x \ln 3$$

Kandece

e) 4^{2x}

$$\frac{d}{dx} 4^{2x} = 4^{2x} \ln 4 \cdot 2$$
$$= 2 \cdot 4^{2x} \ln 4$$

or $\dfrac{2 \cdot (2^2)^{2x} \ln 4}{2^{4x+1} \ln 4}$

ex.2 Find $f'(x)$ if $f(x) = x^2 e^x$.

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

Product Rule!
$\frac{d}{dx}(uv) = u'v + v'u$

ex.3 Find y' if $y = e^{\sqrt{x^2+1}}$

$$y = e^{(x^2+1)^{\frac{1}{2}}}$$
$$y' = e^{\sqrt{x^2+1}} \cdot \frac{1}{2}(x^2+1)^{-\frac{1}{2}}(2x)$$
$$= \frac{x e^{\sqrt{x^2+1}}}{\sqrt{x^2+1}}$$

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