Differentiating natural exponential & logarithms

$$\frac{d}{dx}\left(e^{ax}\right) = ae^{ax}$$

$$\frac{d}{dx}\left(\ln(ax+b)\right) = \frac{a}{ax+b}$$

$$\frac{d}{dx}\left(e^{4x}\right)$$

$$\frac{d}{dx}\left(\frac{1}{\sqrt{e^{3x}}}\right)$$

$$\frac{d}{dt}\left(\ln(5t)\right)$$

$$\frac{d}{dz}\left(\ln\left(\frac{31}{28}z\right)\right)$$

$$\frac{d}{dx}\left(\ln\left(\sqrt{7x^3}\right)\right)$$

$$\frac{d}{dt}\left(\ln\left(\frac{t+2}{t+3}\right)\right)$$

Differentiating natural exponential & logarithms

$$\frac{d}{dx}\left(e^{ax}\right) = ae^{ax}$$

$$\frac{d}{dx}\left(\ln(ax+b)\right) = \frac{a}{ax+b}$$

$$\frac{d}{dx}\left(e^{x}\right) = e^{x}$$

$$\frac{d}{dx}\left(\ln(x)\right) = \frac{1}{x}$$

chain rule

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

$$\frac{d}{dx}\left(\ln(g(x))\right) = \frac{g'(x)}{g(x)}$$

Differentiating natural exponential & logarithms

$$\frac{d}{dx}(e^{ax}) = ae^{ax}$$

$$\frac{d}{dx}(\ln(ax+b)) = \frac{a}{ax+b}$$

$$\frac{d}{dx}(e^{4x}) = 4e^{4x}$$

$a=4$

$$\frac{d}{dx}\left(\frac{1}{\sqrt{e^{3x}}}\right) = \frac{d}{dx}\left(e^{-\frac{3}{2}x}\right)$$

$$= \frac{-3}{2}e^{-3/2x}$$

$\frac{1}{t} = t^{-1}$, $\sqrt{y} = y^{\frac{1}{2}}$, $(a^n)^m = a^{nm}$

$$\frac{1}{\sqrt{z}} = (z^{\frac{1}{2}})^{-1} = z^{-1/2}$$

$$\frac{1}{\sqrt{e^{3x}}} = (e^{3x})^{-\frac{1}{2}} = e^{-\frac{3}{2}x}$$

Differentiating natural exponential & logarithms

$$\frac{d}{dx}\left(e^{ax}\right) = ae^{ax}$$

$$\frac{d}{dx}\left(\ln(ax+b)\right) = \frac{a}{ax+b}$$

$$\frac{d}{dt}\left(\ln(5t)\right) = \frac{5}{5t+0} = \frac{5}{5t} = \frac{1}{t}$$

$a=5$

$b=0$

$\boxed{\text{If } b=0}$

$$\frac{d}{dx}\left(\ln(ax)\right) = \frac{a}{ax} = \frac{1}{x}$$

$$\frac{d}{dz}\left(\ln\left(\frac{31}{28}z\right)\right) = \frac{1}{z}$$

Differentiating natural exponential & logarithms

$$\frac{d}{dx}(e^{ax}) = ae^{ax}$$

$$\frac{d}{dx}(\ln(ax+b)) = \frac{a}{ax+b}$$

$$\frac{d}{dx}\left(\ln\left(\sqrt{7x^3}\right)\right) = \frac{d}{dx}\left(\frac{1}{2}\ln 7 + \frac{3}{2}\ln(x)\right)$$

$$= 0 + \frac{3}{2}\frac{d}{dx}(\ln(x))$$

$$= \frac{3}{2}\,\frac{1}{x}$$

$$= \frac{3}{2x}$$

$$\ln(a^b) = b\ln(a)$$

$$\ln(ab) = \ln(a)\ \ln(b)$$

$$\sqrt{t} = t^{1/2}$$

$$\sqrt{7x^3} = (7x^3)^{\frac{1}{2}}$$

$$\ln\left(\sqrt{7x^3}\right) = \frac{1}{2}\ln(7x^3)$$

$$= \frac{1}{2}\left(\ln(7) + \ln(x^3)\right)$$

$$= \frac{1}{2}\left(\ln(7) + 3\ln(x)\right)$$

$$\frac{d}{dt}\left(\ln\left(\frac{t+2}{t+3}\right)\right) = \frac{d}{dt}\left(\ln(t+2) - \ln(t+3)\right)$$

$$= \frac{1}{t+2} - \frac{1}{t+3}$$

$$\ln\left(\frac{a}{b}\right) = \ln(a) - \ln(b)$$

$$\ln\left(\frac{a}{b}\right) = \ln(ab^{-1})$$

$$\boxed{\text{Differentiating natural exponential \& logarithms} \quad \frac{d}{dx}(e^{ax}) = ae^{ax} \quad \frac{d}{dx}(\ln(ax+b)) = \frac{a}{ax+b}}$$

$$\frac{d}{dx}(e^{4x}) = 4e^{4x} \qquad a=4$$

$$\frac{1}{t} = t^{-1}, \quad \sqrt{y} = y^{\frac{1}{2}}, \quad (a^n)^m = a^{nm}$$

$$\frac{d}{dx}\left(\frac{1}{\underline{\sqrt{e^{3x}}}}\right) = \frac{d}{dx}\left(e^{-\frac{3}{2}x}\right) = -\frac{3}{2}e^{-\frac{3}{2}x}$$

$$\frac{1}{\sqrt{z}} = (\sqrt{z})^{-1} = (z^{\frac{1}{2}})^{-1} = z^{-\frac{1}{2}}$$

$$\frac{1}{\sqrt{e^{3x}}} = (e^{3x})^{-\frac{1}{2}} = e^{-\frac{3x}{2}}$$

$$\frac{d}{dt}(\ln(5t)) = \frac{5}{5t} = \frac{1}{t} \qquad a=5 \quad b=0$$

$$\boxed{\text{if } b=0}$$

$$\frac{d}{dx}(\ln(ax)) = \frac{a}{ax} = \frac{1}{x}$$

$$\ln(a^b) = b\ln(a) \qquad \frac{d}{dz}\left(\ln\left(\frac{31}{28}z\right)\right) = \frac{1}{z}$$

$$\frac{d}{dx}\left(\ln\left(\sqrt{7x^3}\right)\right) = \frac{d}{dx}\left(\ln\left(7x^3\right)^{\frac{1}{2}}\right)$$

$$\frac{d}{dt}\left(\ln\left(\frac{t+2}{t+3}\right)\right)$$