

Differentiate w.r.t.x

$$y = e^{x \log a} + e^{a \log x} + e^{a \log a}$$

Solution:

We'll use next rules

1. $(e^{f(x)})' = e^{f(x)} \cdot f'(x)$
2. $(\log x)' = \frac{1}{x \ln 10}$
3. $(f(x) + g(x))' = f'(x) + g'(x)$
4. $(cx)' = c$ where $c = \text{const}$
5. $c' = 0$ if $c = \text{const}$.

Denote

$$y' = \frac{dy}{dx}$$

Because $a = \text{const}$ and $\log a = \text{const}$ then

$$\begin{aligned} y' &= (e^{x \log a} + e^{a \log x} + e^{a \log a})' = (e^{x \log a})' + (e^{a \log x})' + (e^{a \log a})' = \\ &= e^{x \log a} \cdot (x \log a)' + e^{a \log x} \cdot (a \log x)' + 0 = \log a e^{x \log a} + \\ &\quad + \frac{a}{x \ln 10} e^{a \log x}. \end{aligned}$$

Answer:

$$y' = \log a e^{x \log a} + \frac{a}{x \ln 10} e^{a \log x}$$