Exponential Function a^x, where a> 0.

$\because a^x = e^{\log_e a^x} = e^{x \log_e a}$

$\therefore a^x = e^{\alpha x}$ ....(i) , where $\alpha = \log_e a$. We have, $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} .... + \frac{x^r}{r!} + ... \infty$

Replacing x by αx in this series, $e^{\alpha x} = 1 + \frac{\alpha x}{1!} + \frac{\alpha^2 x^2}{2!} + \frac{\alpha^3 x^3}{3!} + ... + \frac{\alpha^r x^r}{r!} + ... \infty$

Hence from (i), $a^x = 1 + \frac{\log_e a}{1!} x + \frac{(\log_e a)^2}{2!} x^2 + ... + \frac{(\log_e a)^r x^r}{r!} + ... \infty$