Assignment 2

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Problem 1(viii), ICSE 12 2019:
Using L'Hospital's Rule, evaluate:
$\lim_{x\to 0} \frac{8^x-4^x}{4x}$
Solution:
we know that,
if there is a function $f(x) = \frac{g(x)}{h(x)}$
then by L'Hospital's Rule

$$\lim_{x\to x_0} f(x) = \lim_{x\to x_0} \frac{g(x)}{h(x)} \tag{1}$$

$$= \lim_{x\to x_0} \frac{g'(x)}{h'(x)} \tag{2}$$

so,by equation (2),

$$\lim_{x\to 0} \frac{8^x - 4^x}{4x} = \lim_{x\to 0} \frac{\frac{\mathrm{d}(8^x-4^x)}{\mathrm{d}x}}{\frac{\mathrm{d}(4x)}{\mathrm{d}x}} \tag{3}$$

$$= \lim_{x\to 0} \frac{8^x \log 8 - 4^x \log 4}{4} \tag{4}$$

Now,putting value of x=0,we get

$$= \frac{\log 8 - \log 4}{4} \tag{5}$$

$$= \frac{\log 2}{4} \tag{6}$$

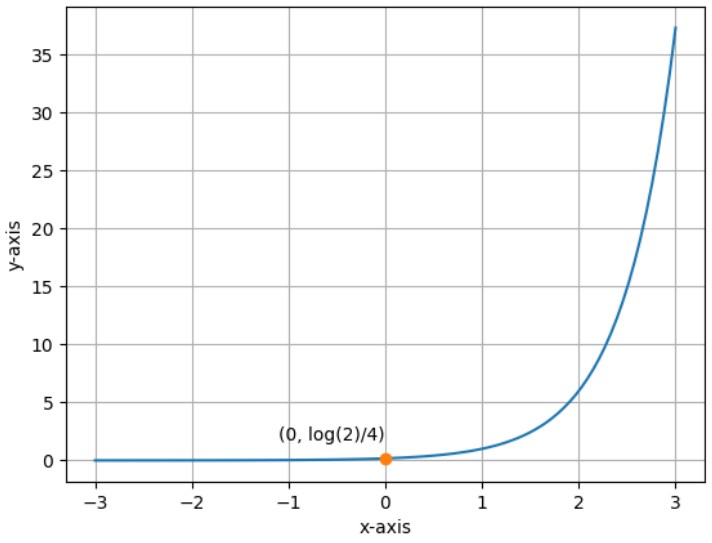

Fig. 1. graph representing the given curve and limiting point