Assignment 1

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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

$$Lim_{x \to x_0} f(x) = Lim_{x \to x_0} \frac{g(x)}{h(x)} \quad = Lim_{x \to x_0} \frac{g'(x)}{h'(x)}$$
$$(1)$$

so,by equation (1),

$$Lim_{x \to 0} \frac{8^x - 4^x}{4x} = Lim_{x \to 0} \frac{\frac{d(8^x - 4^x)}{dx}}{\frac{(4x)}{dx}}$$
$$(2)$$

$$= Lim_{x \to 0} \frac{8^x \log 8 - 4^x \log 4}{4}$$
$$(3)$$

Now,putting value of x=0,we get

$$= \frac{\log 8 - \log 4}{4}$$
$$(4)$$

$$= \frac{\log 2}{4} \qquad (5)$$