

# Assignment 2

**Himanshu Kumar Gupta (AI21BTECH11012)**

**Problem 1(viii), ICSE 12 2019:**

Using L'Hospital's Rule, evaluate:

$$\lim_{x \rightarrow 0} \frac{8^x - 4^x}{4x}$$

**Solution:**

we know that,

if there is a function  $f(x) = \frac{g(x)}{h(x)}$

then by L'Hospital's Rule

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

so, by equation (1),

$$\lim_{x \rightarrow 0} \frac{8^x - 4^x}{4x} = \lim_{x \rightarrow 0} \frac{\frac{d(8^x - 4^x)}{dx}}{\frac{d(4x)}{dx}} \quad (2)$$

$$= \lim_{x \rightarrow 0} \frac{8^x \log 8 - 4^x \log 4}{4} \quad (3)$$

Now, putting value of  $x=0$ , we get

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

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