

## Limit and Continuity : Infinite Limits

EXP  
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using def Prove that

$$\lim_{x \rightarrow \infty} \frac{e^x}{2e^x + 3} = \frac{1}{2}$$

Sol.

$$f(x) = \frac{e^x}{2e^x + 3} \quad l = \frac{1}{2}$$

$$|f(x) - l| = \left| \frac{e^x}{2e^x + 3} - \frac{1}{2} \right| = \left| \frac{\cancel{2e^x} - \cancel{2e^x} - 3}{2(2e^x + 3)} \right|$$

$$|f(x) - l| = \frac{3}{2(2e^x + 3)}$$

$$[\because 2e^x + 3 > 0]$$

$$|f(x) - l| < \epsilon$$

$$\text{if } \frac{3}{2(2e^x + 3)} < \epsilon$$

$$\text{if } \frac{1}{2e^x + 3} < \frac{2\epsilon}{3}$$

$$\text{if } 2e^x + 3 > \frac{3}{2\epsilon}$$

if  $2e^x > \frac{3}{2\epsilon} - 3$

if  $e^x > \frac{1}{2} \left( \frac{3}{2\epsilon} - 3 \right)$

if  $x > \log \left[ \frac{1}{2} \left( \frac{3}{2\epsilon} - 3 \right) \right]$

$\therefore$  for given  $\epsilon > 0 \quad \exists M = \log \left[ \frac{1}{2} \left( \frac{3}{2\epsilon} - 3 \right) \right] > 0$

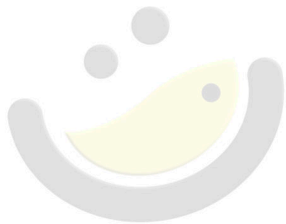
s.t.  $|f(x) - L| < \epsilon$  for  $x > M$ .

$\therefore$  By def.

$$\lim_{x \rightarrow \infty} f(x) = l.$$

$$\lim_{x \rightarrow \infty} \frac{e^x}{2e^x + 3} = \frac{1}{2}$$

Hence Proved



OMG! MATHS }  
The poetry of logical ideas.