

PENURUNAN DALIL L'HOPITAL

JIKA $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{0}{0}$, MAKA

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(a)}{g'(a)}$$

BUKTI:

JIKA $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{0}{0}$, MAKA

$$\lim_{x \rightarrow a} f(x) = 0 \quad \text{DAN} \quad \lim_{x \rightarrow a} g(x) = 0$$

$\rightarrow \boxed{f(a) = 0} \qquad \rightarrow \boxed{g(a) = 0}$

DERET TAYLOR

$$f(x) = f(a) + \frac{f'(a)}{1!} (x-a) + \dots$$

$$g(x) = g(a) + \frac{g'(a)}{1!} (x-a) + \dots$$

$$\begin{aligned} \lim_{x \rightarrow a} \frac{f(x)}{g(x)} &= \lim_{x \rightarrow a} \frac{f(a) + \frac{f'(a)}{1!} (x-a)}{g(a) + \frac{g'(a)}{1!} (x-a)} \\ &= \lim_{x \rightarrow a} \frac{0 + f'(a) \cdot (x-a)}{0 + g'(a) \cdot (x-a)} \\ &= \lim_{x \rightarrow a} \frac{f'(a) \cdot (x-a)}{g'(a) \cdot (x-a)} \end{aligned}$$

$$\boxed{\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(a)}{g'(a)}}$$

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WIKARIA GAZALI

DOSEN MATEMATIKA
UNIV. BINA NUSANTARA, JKT.