나눗셈의 극한은 극한의 나눗셈이다.

(The limit of a quotient is the quotient of the limits(provided that the limit of the denominator is not 0).)



▶ Start

$$\lim_{x \to a} f(x) = L$$

▶ Start

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

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$$\left|\frac{1}{g(x)} - \frac{1}{M}\right|$$

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|M|

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$$\left|\frac{1}{g(x)} - \frac{1}{M}\right| = \left|\frac{M - g(x)}{Mg(x)}\right| = \frac{1}{|Mg(x)|} |g(x) - M|$$

$$\exists \delta_1 > 0 \text{ s.t. } 0 < |x - a| < \delta_1 \Rightarrow |g(x) - L| < \frac{|M|}{2} \ (\because \lim_{x \to a} g(x) = M)$$

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$$\exists \delta_2 > 0 \text{ s.t. } 0 < |x - a| < \delta_2 \Rightarrow |g(x) - M| < \frac{M^2}{2} \epsilon \left(\because \lim_{x \to a} g(x) = M \right)$$

$$\delta = \min\{\delta_1, \delta_2\} \quad \therefore \, \forall \epsilon > 0, \, \exists \delta > 0$$

Theorem

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

$$\lim_{x \to a} \left\{ \frac{f(x)}{g(x)} \right\} = \frac{L}{M}$$

Show that
$$\lim_{x \to a} \left\{ \frac{1}{g(x)} \right\} = \frac{1}{M}$$

$$\epsilon > 0$$

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 : $\forall \epsilon > 0, \exists \delta > 0 \text{ s.t. } 0 < |x - a| < \delta \Rightarrow$

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Show that
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 $\epsilon > 0$

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 ... $\forall \epsilon > 0, \exists \delta > 0 \text{ s.t. } 0 < |x - a| < \delta \Rightarrow \left| \frac{1}{g(x)} - \frac{1}{M} \right| < \epsilon$

Theorem

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

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Show that
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$$\lim_{x \to a} \left\{ \frac{f(x)}{g(x)} \right\}$$

Theorem

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

$$\lim_{x \to a} \left\{ \frac{f(x)}{g(x)} \right\} = \frac{L}{M}$$

Proof.

Show that
$$\lim_{x \to a} \left\{ \frac{1}{g(x)} \right\} = \frac{1}{M}$$
 $\epsilon > 0$

$$\left| \frac{1}{g(x)} - \frac{1}{M} \right| = \left| \frac{M - g(x)}{Mg(x)} \right| = \frac{1}{|Mg(x)|} |g(x) - M|$$

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$$\lim_{x \to a} \left\{ \frac{f(x)}{A} \right\} = \lim_{x \to a} \left\{ \frac{f(x)}{A} \right\}$$

Theorem

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

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Show that
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$$\left| \frac{1}{g(x)} - \frac{1}{M} \right| = \left| \frac{M - g(x)}{Mg(x)} \right| = \frac{1}{|Mg(x)|} |g(x) - M|$$

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$$\lim_{x \to a} \left\{ \frac{f(x)}{A} \right\} = \lim_{x \to a} \left\{ \frac{f(x)}{A} \right\} = \lim_{x \to a} \left\{ \frac{f(x)}{A} \right\} = \lim_{x \to a} \left\{ \frac{f(x)}{A} \right\}$$

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Theorem

$$\lim_{x \to a} f(x) = L, \lim_{x \to a} g(x) = M(\neq 0)$$

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