함수의 상수배의 극한은 함수의 극한의 상수배이다.
(The limit of a constant times a function is the constant times the limit of the function.)

Start

Theorem

Start

Theorem

c : *constant*

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : $constant$, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x)$$

Start

Theorem

$c : constant, \lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$|cf(x) - cL|$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$|cf(x) - cL| = |c| \cdot |f(x) - L|$$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t.

Start

Theorem

c : $constant$, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1$

Start

Theorem

c : $constant$, $\lim_{x\to a} f(x) = L$

$$\lim_{x\to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c|+1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow$

Start

Theorem

c : *constant*, $\lim_{x\to a} f(x) = L$

$$\lim_{x\to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\le (|c|+1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x-a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c|+1}$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0 \text{ s.t. } 0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1} \ (\because \lim_{x \to a} f(x) = L)$

δ

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta$

The limit of a constant times a function is the constant times the limit of the function.

▸ Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0, \exists \delta > 0$

Start

Theorem

c : *constant*, $\lim_{x\to a} f(x) = L$

$$\lim_{x\to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x\to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall\epsilon > 0, \exists\delta > 0$ s.t.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0, \exists \delta > 0$ s.t. $0 < |x - a| < \delta$

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0, \exists \delta > 0$ s.t. $0 < |x - a| < \delta \Rightarrow$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0, \exists \delta > 0$ s.t. $0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

The limit of a constant times a function is the constant times the limit of the function.

Start

Theorem

c : *constant*, $\lim_{x \to a} f(x) = L$

$$\lim_{x \to a} cf(x) = cL$$

Proof.

$\epsilon > 0$

$$\begin{aligned} |cf(x) - cL| &= |c| \cdot |f(x) - L| \\ &\leq (|c| + 1)|f(x) - L| \end{aligned}$$

$\exists \delta_1 > 0$ s.t. $0 < |x - a| < \delta_1 \Rightarrow |f(x) - L| < \dfrac{\epsilon}{|c| + 1}$ $(\because \lim_{x \to a} f(x) = L)$

$\delta = \delta_1$

$0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\therefore \forall \epsilon > 0, \exists \delta > 0$ s.t. $0 < |x - a| < \delta \Rightarrow |cf(x) - cL| < \epsilon$

$\square$

Home