1. New

Homeomorphisms are monotonous

Let:

- $f : \mathbb{R} \to \mathbb{R}$ homeomorphism

Then, holds:

- f monotonous

Demonstration:

no demonstration

Homeomorphisms and n-periodic points

Let:

- $f : \mathbb{R} \to \mathbb{R}$ homeomorphism (M, T, ϕ) dynamical system defined by f

Then, holds:

- $\forall\, n \in \mathbb{N}$:

  $\nexists\, x \in M$ „ x n-periodic point

Demonstration:

graphically

Decreasing function orbits

Let:

$\cdot$ *declarations*

.

Show that:

$\cdot$ *statements*

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Demonstration:

f corta en un punto

f decreasing $\rightarrow$ f^2 increasing

$f^{2n} \xrightarrow{n}$ fixed point of f

10.

Let:

$\cdot\ f\ :\ \mathbb{R}^+ \to \mathbb{R}^+ \in \mathbb{C}^\infty$

$\cdot\ f(0) = 0$

$\cdot\ p \in \mathbb{R}^+ \setminus \{0\}\ \ _{\shortparallel}\ f'(p) \geq 0$

$\cdot\ f'$ decreasing

Show that:

$\cdot\quad \forall\ p \in \mathbb{R}^+ \setminus \{0\}$:

$$f^n(x) \xrightarrow{n} p$$

Demonstration:

f' decreasing $\to f'' < 0 \to f$ concave

f positive $\to f$ has no extrema $\to f' > 0 \to f$ increasing

f has only one fixed point

Suppose 2 fixed points : p, p'

$IVT \to\ \exists\ c \in (0, p')$:

$$f'(c) = 1$$

$f'(p) < 1 \to p$ attractive $IVT \to$ dont exist more fixed points $\to f'(c') = 1 \not\leq 1$

$\forall\ x \in (0, p)$:

$$f(x) > x$$

$\forall\ x \in \mathbb{R}\ \ _{\shortparallel}\ x > p$:

$$f(x) < x$$

f increasing $\to f([0, p]) = [0, p]$