

Remarks on the infinite-dimensional counterparts of the Darboux theorem

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Abstract

The Darboux theorem, one of the fundamental results in analysis, states that the derivative of a real (not necessarily continuously) differentiable function defined on a compact interval has the intermediate value property, i.e. attains each value between the derivatives at the endpoints. The Bolzano intermediate value theorem, which implies Darboux's theorem when the derivative is continuous, states that a continuous real-valued function f defined on $[-1, 1]$ satisfying $f(-1) < 0$ and $f(1) > 0$, has a zero, i.e. $f(x) = 0$ for at least one number $x \in [-1, 1]$.

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