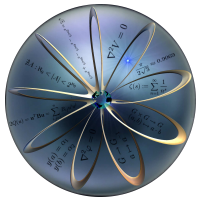

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proof of Darboux's theorem

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Without loss of generality we migth and shall assume $f'_+(a) > t > f'_-(b)$. Let $g(x) := f(x) - tx$. Then $g'(x) = f'(x) - t$, $g'_+(a) > 0 > g'_-(b)$, and we wish to find a zero of g'.

Since g is a continuous function on $[a, b]$, it attains a maximum on $[a, b]$. Since $g'_+(a) > 0$ and $g'_+(b) < 0$ `http://planetmath.org/FermatsTheoremStationaryPoints`Ferma theorem states that neither a nor b can be points where f has a local maximum. So a maximum is attained at some $c \in (a, b)$. But then $g'(c) = 0$ again by `http://planetmath.org/FermatsTheoremStationaryPoints`Fermat's theorem.