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## Fermat's theorem (stationary points)

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Let  $f: (a, b) \rightarrow \mathbb{R}$  be a continuous function and suppose that  $x_0 \in (a, b)$  is a local extremum of  $f$ . If  $f$  is differentiable in  $x_0$  then  $f'(x_0) = 0$ .

Moreover if  $f$  has a local maximum at  $a$  and  $f$  is differentiable at  $a$  (the right derivative exists) then  $f'(a) \leq 0$ ; if  $f$  has a local minimum at  $a$  then  $f'(a) \geq 0$ . If  $f$  is differentiable in  $b$  and has a local maximum at  $b$  then  $f'(b) \leq 0$  while if it has a local minimum at  $b$  then  $f'(b) \geq 0$ .