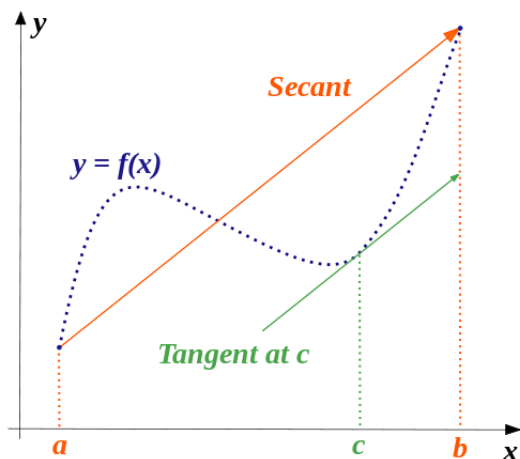


Mean Value Theorem

A man passes a police car at point A doing 60 mph (the speed limit) and 4 minutes later passes another police car at point B , also doing 60 mph, yet the second officer writes him a ticket for speeding, justified by the mean value theorem. The reason: point A and point B are 5 miles apart, hence the average speed over this interval was 75 mph, and *must at least have been equaled at some point*.

If f is a "nice" function on the interval (a, b) then there exists at least one point c in that interval where

$$f'(c) = \frac{f(b) - f(a)}{b - a}$$



What does it take to be "nice"? The function f must be continuous

over the closed interval $[a, b]$ and differentiable over the open interval (a, b) .

The proof of the MVT relies on Rolle's Theorem, which is similar. Rolle's Theorem says that for a "nice" f , if $f(a) = f(b)$, then there will exist at least one point c in the interval (a, b) such that $f'(c) = 0$. The MVT proof basically turns Rolle's interval so that $a \neq b$.

Problems: