Rolle's Theorem Encyclopedia Article

Rolle's Theorem

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Rolle's Theorem

Rolle's **theorem** implies that if we have a function *f* that is continuous on an **interval** [*a, b*] and *f(a) = f(b)*, then there always exists at least one critical point of the function in (*a, b*). The theorem is usually written symbolically as: Assume *f* is a function that is continuous on [*a, b*] and differentiable on (*a, b*). If *f(a) = f(b)* then there is a number *c* in (*a, b*) such that the derivative of *f* at *c*, *f'(c)* = 0. From Rolle's theorem it follows that *c* is at least one critical point of *f* in (*a, b*). This means that at some point (*c, f(c)*) on the graph of *f* that the **slope** of the tangent line is 0. There may be more than one such point *c* but the theorem provides that there exist at least one. The line tangent to point (*c, f(c)*) is parallel to the line joining (*a, f(a)*) to (*b, f(b)*).

Rolle's theorem is named after the French mathematician **Michel Rolle** who developed the theorem during the 17th century. Rolle's theorem is very closely related to the **mean** value theorem. In the mean value theorem *f(a)* does not have to equal *f(b)* but there is still at lest one point in between these two on *f* where the slope of the tangent line is parallel to that of the line connecting (*a, f(a)*) and (*b, f(b)*). The mean value theorem is a generalized form of Rolle's theorem that is applicable to a wider variety of situations but has a similar meaning.