CH 4: Applications of Differentiation

4.2 The Mean Value Theorem

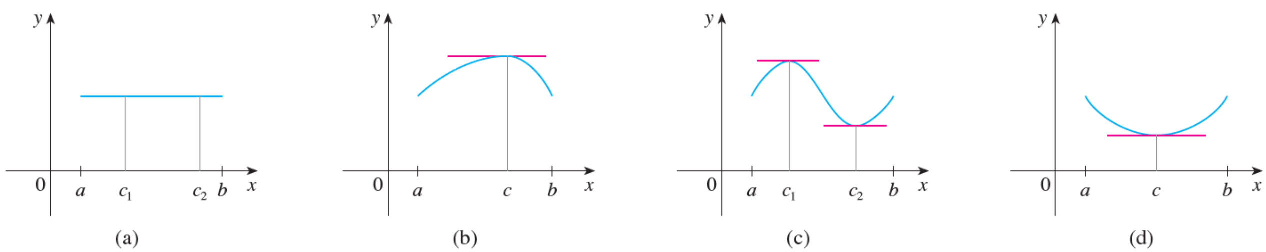
1. Rolle's Theorem (helps find a root of the derivative on a given interval): If

   (a) f is continuous on $[a, b]$,

   (b) f is differentiable on (a, b), and

   (c) $f(a) = f(b)$

   then there exists $c \in (a, b)$ such that $f'(c) = 0$

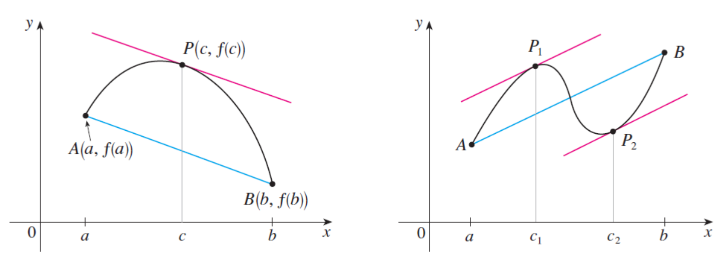


2. Mean Value Theorem (shows the existence of a point c where the slope of the tangent line to the function matches the slope of the secant line joining the end points of the interval): If

   (a) f is continuous on $[a, b]$, and

   (b) f is differentiable on (a, b),

   then there is a number $c \in (a, b)$ such that $f'(c) = \frac{f(b)-f(a)}{b-a}$



3. f is the constant function on $(a, b) \iff f'(x) = 0$ for all values $x \in (a, b)$

4. if two functions have the same derivative, then they are vertical shifts of each other: $f(x)' = g(x)'$ then $f(x)' - g(x)' = 0$ and so $f(x) - g(x) =$ constant, say $f(x) = g(x) + c$