MAT 201

The Rolle's Theorem

Suppose f(x) is continuous in a closed interval [a,b] and differentiable in open interval (a,b). If f(a) = f(b) = 0 then there exist f'(c) = 0

[a,b] = $a \le x \le b$
(a,b) = $a < x < b$.

Since f(x) is continuous it has absolute maximum & minimum in the closed interval [a,b] this occurs only at

1. Interior point where f'(x) = 0
2. Interior point where f'(x) does not exist
3. Then end points of [a,b]

The Mean Value Theorem

Suppose f(x) is continuous in a closed interval [a,b] and differentiable in (a,b) there exists $\frac{f(b)-f(a)}{b-a} = f'(c)$ where $f'(c)$ is called instantaneous change and $\frac{f(b)-f(a)}{b-a}$ is called the average change or the mean value.

Locals

Local Maximum:
In mathematics, a local maximum is a point on a function at which the function value is greater than or equal to the function values at all nearby points. In other words, it is a peak in the function's graph that is surrounded by points of lower value. It is also sometimes called a relative maximum or a strict local maximum if it is greater than all nearby points.

Local Minimum
local minimum is a point at which the function value is less than or equal to the function values at all nearby points. I

Local Extremum
In mathematics, a local extremum is a point on a function at which the function value is either a local maximum or a local minimum. A local extremum is a point on the function's graph where the slope of the function changes from positive to negative (for a local minimum) or from negative to positive (for a local maximum).

Define Mean Value Theorem

The Mean Value Theorem states that for any function that is continuous on a closed interval and differentiable on an open interval, there exists at least one point in the open interval where the function's derivative is equal to the average rate of change of the function over the closed interval.

Define real valued function:

A real valued function is a function that assigns a real number to each element in its domain. The domain is the set of input values, and the range is the set of output values. The function can be represented by an equation, such as $y = f(x)$, where x is the input value and y is the output value.

Define Taylor Series

Taylor's Theorem states that any function that is infinitely differentiable at a single point can be represented as an infinite sum of terms, called Taylor series, in the form of $f(x) = f(a) + (x-a)f'(a) + (x-a)^2/2!\ f''(a) + ... + (x-a)^n/n!\ f^n(a) + R_n(x)$ where $f^n(a)$ is the nth derivative of f evaluated at point a, and $Rn(x)$ is the remainder term.

Define a Bounded Function

A bounded function is a function whose output values are confined within a certain range or "bound." The bounds could be upper, or lower.