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I.D NO 7614

SUBJECT NUMERICAL ANALYSIS

ASSIGNMENT NO 01st

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REVIEW OF INTEGRATION CONCEPT:

In differentiation, we studied that if a function $f(x)$ is differentiable in an interval say, I. Then we can get a set of family of values of the functions in that interval, Is there any way by which we can get to know about the function. If the values of the function with an interval are known.

→ This process is the reverse of finding a derivatives. Integration are the anti-derivatives. Integration are the way of adding the parts to find the whole integration is the whole pizza and the slices are differentiable functions.

Which can be integrated. If $f(x)$ is any function. And $f(x)$ & $f'(x)$ is its derivatives. The Integration of $f'(x)$ with respect to dx is given as;

$$\int f'(x)\,dx = f(x) + C.$$

* APPLICATION OF TRAPOZAIDAL RULE IN ENGINEERING:

We know from previous lesson that we can use Riemann sums to evaluate a definite Integral $\int_a^b f(x)\,dx$.

Riemann sums use rectangulars to approximate the area under the curve.

→ Another useful integration rule is the trapozaidal rule. Under this rule, the area under the curve is evaluated by dividing the total area into little trapozoidal rather than rectangles.

Lets $f(x)$ be continous on (a, b).

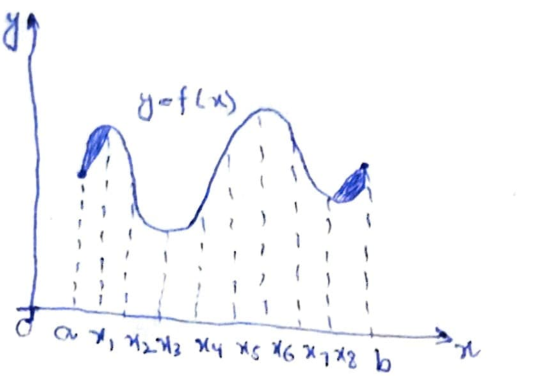
we partition the interval (a, b) into n equal Subintervals, each of width.

$$\Delta x = \frac{b-a}{n}$$

Such that

$$a = x_0 < x_1 < x_2 < \ldots\ldots < x_n = b.$$

The Trapozaidal rule; for approximating $\int_a^b f(x)\,dx$ is given by;



$$\int_a^b f(x)\,dx \approx T_n = \frac{\Delta x}{2}\left[f(x_0) + 2f(x_1) + 2f(x_2) + \ldots\ldots + 2f(x_{n-1}) + f(x_n)\right].$$

Where $\Delta x = \frac{b-a}{n}$ and $x_i = a + i\Delta x$.

As $n \to \infty$, the right hand side of the expression approches the definite Integral $\int_b^a f(x)\,dx$.

* APPLICATION OF SIMPSON'S RULE IN ENGINEERING:

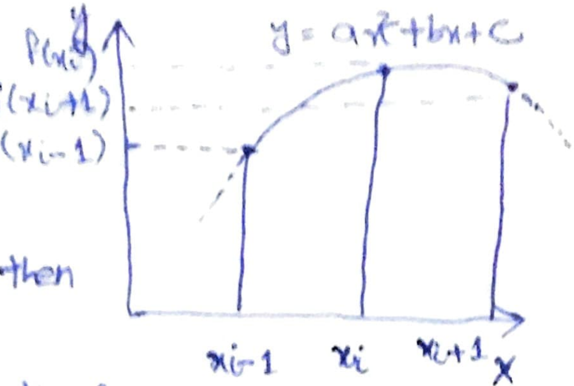
Simpsons rule is a numerical method that approximates the value of a definite integral by using quardatic functions.

→ Simpsons Rules is based on the fact that given three points, we can find the equation of a quardatic through those point.

→ To obtain an approximate of the definite integral $\int_a^b f(x)\,dx$ using Simpsons Rule, we partition the interval (a, b) into a even number n of sub intervals, each of width

$$\Delta x = \frac{b-a}{n}.$$

on each pair of consecutive subintervals $(x_{i-1}, x_i), (x_i, x_{i+1})$, we consider a quadratic function $y = ax^2 + bx + c$ such that it passes through the point $(x_{i-1}, f(x_{i-1}))$, $(x_i, f(x_i))$, $(x_{i+1}, f(x_{i+1}))$.



→ If the function $f(x)$ is continuous on $[a, b]$ then

If the function $f(x)$ is continous on $[a,b]$ then;

$$\int_a^b f(x)\,dx \approx \frac{\Delta x}{3}\left[f(x_0) + 4f(x_1) + 2f(x_2) + 4f(x_3) + 2f(x_4) + \cdots + 4f(x_{n-1}) + f(x_n)\right].$$

The coefficients in Simpson's rule have the following pattern:

$$\underbrace{1, 4, 2, 4, 2, \ldots\ldots, 4, 2, 4, 1}_{n+1 \text{ points}}$$