Sheet-5

Lecture - 8

Weddle's Rules:

putting $n=6$ in eq^n of Newton-Cotes formulae

$$I = \int_a^b f(x)\,dx \simeq \int_a^b f_6(x)\,dx$$

& neglecting the differences of order higher than six, we obtain Weddle's rule

$$\int_{x_0}^{x_6} y\,dx = \frac{3h}{10}\left[y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + y_6\right]$$

the error in which is given by $E = -\frac{h^8}{140} y_6$.

* General quadrature formulae is called Newton-Cotes Integration Formulae

Iterative Process/Method:

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Suppose we require the roots of an eq^n $f(x)=0$ - - - - - (2.1)

It is possible, by simplification, to express the given eq^n in the form

$$x = g(x) \text{ - - - - - } (2.2)$$

whose roots are the same as those of (2.1). We shall start with a trial solution $x = x_1$ for (2.2) & obtain

$$x_2 = g(x_1)$$

Next, we take $x = x_2$ in (2.2) & write

$$x_3 = g(x_2)$$

... a sequence

In general,

$$x_{n+1} = g(x_n), \quad n = 1, 2, 3, \ldots$$

If the sequence $x_1, x_2, x_3, \ldots$ is convergent, then the limiting value say x_0 is a sol^n of (2·2) & hence of (2·1)

This method is also called the direct substitution method, in which we obtain successively improved approximation to a solution of (2·1)

If $x_1, x_2, \ldots$ does not converge, we do not get the sol^n.

The process of repeated application of an algorithm to obtain a value using the preceding one each time is called iteration. The successive values $x_1, x_2, \ldots, x_n, \ldots$ are called iterates; x_n is the nth iterate.

example: $2x^2 - 4x + 1 = 0$

$$\Rightarrow x = \left(\frac{1}{2}\right)x^2 + \frac{1}{4}$$

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n	x_n
1	1·0
2	0·75
3	·53125
⋮	
13	·292894
14	·292893
15	·292893

Divergence

n	x_n
1	2.0
2	2.25
3	2.78125
4	4.117676
5	8.727627
6	38.335736
7	735.064321
⋮	⋮