OMEGA ACADEMY, NUMERICAL METHODS COURSE.

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Numerical Methods

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Guide numerical methods.
Multimedia Engineering and Systems Engineering

UNIT NINE

Trapezoids Method

This is a method of numerical integration, meaning that is used to calculate the approximate value of the definite integral. This method focuses on the approximation of the value of the integral of F (x) by the linear function that passes through the points (a, F (a)) and (b, F (b)).

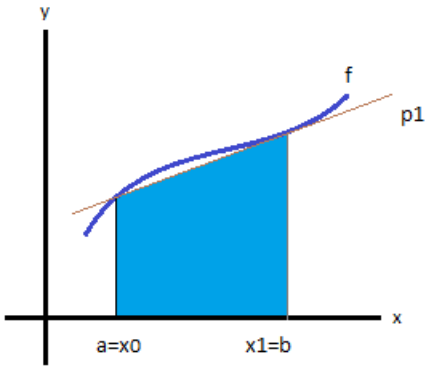

Figure 1: Graph Trapezoids method

$$Trapezoid\ Area = \frac{f(xi) + f(xi-1)}{2} * h$$

$$AreaTr = \left[\frac{f(x_0) + f(x_1)}{2}\right]\Delta x + \left[\frac{f(x_1) + f(x_2)}{2}\right]\Delta x + \cdots + \left[\frac{f(x_{n-1}) + f(x_n)}{2}\right]\Delta x$$

$$AreaTr = [f(x_0) + f(x_1) + f(x_1) + f(x_2) + \ f(x_2) + \cdots + f(x_{n-1}) + f(x_n)]\frac{\Delta x}{2}$$

$$\int_a^b f(x)dx = [f(x_0) + 2\sum_{i=1}^{n-1} f(xi) + f(xn)]\frac{\Delta x}{2}$$

Example:

Using the trapezoidal method with subintervals n = 1 to approximate the following integral.

$$\int_1^2 \frac{x^3 dx}{1 + x^{\frac{1}{2}}}$$

$$I = \int_a^b f(x)dx = \frac{h}{2}[f(a) + f(b)]$$

$$h = \frac{b - a}{n}$$

Then

$$a = 1$$

$$b = 2$$

$$n = 1$$

Next

$$h = \frac{2-1}{1} = 1$$

$$f(a) = f(1) = 0.5$$

$$f(b) = f(2) = 3.313708$$

Supersede in the formula

$$I = \frac{1}{2}[0.5 + 3.313708]$$

$$I = 1.906854$$