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Lecture # 7

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Definite Integral as Limit of a Sum :-
 where a and b are lower and upper limits.

$$\int_a^b f(x) dx = F(b) - F(a)$$

is called definite integral

Q1 :- $\int_{-2}^2 x dx$

$$\int_{-2}^2 x dx = \left[\frac{x^2}{2} \right]_{-2}^2 = \frac{2^2}{2} - \frac{(-2)^2}{2} = 1 - 1 = 0$$

Q2 :- $\int_0^6 f(x) dx$, where $f(x) = \begin{cases} x^2 & \text{if } x < 2 \\ 3x-2 & \text{if } x \geq 2 \end{cases}$

$$\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$$

$$\int_0^6 f(x) dx = \int_0^2 x^2 dx + \int_2^6 (3x-2) dx$$

$$= \left[\frac{x^3}{3} \right]_0^2 + \left[\frac{3x^2}{2} - 2x \right]_2^6$$

$$= \left(\frac{8}{3} - 0 \right) + \left(54 - 12 \right) - \left(6 - 4 \right)$$

$$= \frac{8}{3} + 42 - 2 = \frac{8}{3} + 40 = \frac{128}{3}$$

Q3 :- $\int_{-1}^5 |x-2| dx = \int_{-1}^2 |x-2| dx + \int_2^5 |x-2| dx$