# Area of Bounded Regions

## Theorem 1:-

Let f(x) be continuous & finite in [a,b]. Then,

The area bounded by the curve y=f(x), the X-axis & the ordinates x=a & x=b, is equal to $\int_a^b ydx$.

Mathematically,

$$\int_a^b y\,dx = \int_a^b f(x)dx$$

## Theorem 2:-

Let f(y) be continuous & finite in [a,b]. Then,

The area bounded by the curve x=f(y), the Y-axis and the absicca y=c, y=d is equal to $\int_c^d x\,dy$.

Mathematically,

$$\int_c^d x\,dy = \int_c^d f(y)dy$$

# Rolle's and Lagrange's Theorem

## Rolle's Theorem:-

Let f(x) be a real valued function, defined in the closed interval [a,b] such that

(i) f(x) is continuous in [a,b]
(ii) f(x) is differentiable in [a,b]
(iii) f(a)=f(b)

Then, there exists a real number c in (a,b) such that f'(c)=0.

## Lagrange's MVT:-

Let f(x) be a real function such that

(i) f(x) is continuous in [a,b]
(ii) f(x) is differentiable in (a,b)

Then, there exists a real number c ∈ (a,b) such that $f'(c) = \frac{f(b)- f(a)}{b-a}$

# Dynamics

(1) The displacement x, velocity v & acceleration f at t times for a particle moving in a straight line.

Then, $v = \frac{dx}{dt}$ & $f = \frac{dv}{dt} = \frac{d^2x}{dt^2} = v\frac{dv}{dx}$

(2) Formulae of motion along a straight line of a particle with uniform acceleration

(i) $v = u + ft$

(ii) $s = ut + \frac{1}{2}ft^2$

(iii) $v^2 = u^2 + 2fs$

(iv) $s_t = u + \frac{1}{2}f(2t - 1)$

where, u=initial velocity of the particle