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Subject :- Applied Calculus

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Assignment :- 01

(Q1) Application of Derivates & Integration in Engineering. ①

Ans:- "Application of Integration:-"

Following are the application as given below:-

1) "Shear force & bending moment:-"

→ Shear force and bending moment are one of the important parameter for structural design these parameter, affects a structure alot.

→ Some forces will develop inside the rod which will try to break the rod ~~Constructed~~ so we ~~use integration for this purpose~~ in direction

$$\text{Area} = \int_a^b f(x)\,dx.$$

of force that force is called shear force & Product of that force with distance from either end is bending moment.

2) "Length of Curve:-"

Corrugated iron is used extensively through out the world as a versatile through material - bending the material into a regular since wave pattern gives it greater strength than if a flat sheed is used. ②

⇒ So integration is used to find out how wide should the flat sheet be to give us a corrugated sheet of required width.

3) "Area under a curve by integration:-"

In civil engineering when we are dealing with curve or structure having curve then may need to find the area under the curve which is to be constructed so we use integration for this purpose

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

4) "Moment of inertia by integration:-"

Moment of ~~inter~~ inertia is a geometrical property of a section of a structural member which is required to measure its resistance to bending and buckling.

⇒ 2 moment of inertia about x-axis

$$I_x = \int_A y^2 dA$$

⇒ 2 moment of inertia about y-axis

$$I_y = \int_A x^2 dA$$

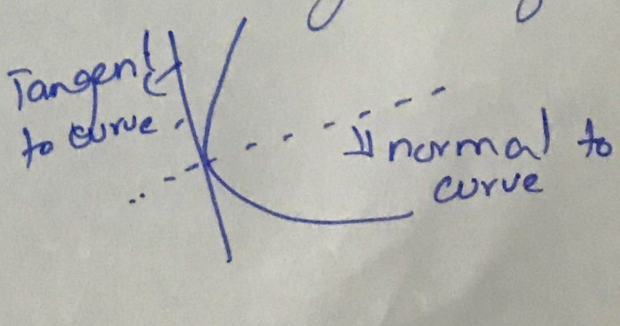
5) "Centroid of an area by integration:-"

In tilt slab Construction we have a Concrete wall which we need to raise into position. We don't want the wall to Crack as we raise it so we need to know the center of mass of the wall we Can find the centroid of an area with straight side then we will extend the Concept the area with curved side where we will use integration.

"Application of Derivatives:-"

1) "Tangent And Normal:-"

A tangent to a curve is a line that touches the curve at one point and has the same slope as the curve at that point. A normal to a curve is a line perpendicular to a tangent of the curve.



2) "Newton Method:-"

The process ~~is~~ involves making a guess at the true solution and then applying a formula to get a better guess and until we arrives at an acceptable approximation for the solution.

If we find x so that $f(x)=0$ then we guess some initial value x_0 ~~and~~ which is close to desired solution and then we get a better ~~solution and~~ approximation using newton method

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

3) "Related Rates:-"

If two variable both vary with respect to time and have a relation b/w them, we can express the rate of change of one in term of one another.

Thats is we'll be finding $\frac{df}{dt}$ for some function $f(t)$.

4) "Curvilinear Motion:-" ⑤

These formula are only appropriate for rectilinear motion ~~and~~. This is inadequate for most real situation so we introduce here the concept of curvilinear motion, where an object is moving in a plane along a specified curved path. We generally express the x & y component of the motion as function of time. This form is called parametric form

5) "Radius of Curvature:-"

$$= \frac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\left[\frac{d^2y}{dx^2}\right]}$$

The radius of curvature of the curve at a particular point is defined as the radius of the approximating circle. This radius changes as we move along the curve. The formula for the radius of curvature at any point x for the curve y = f(x)