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SECTION : B

SUBJECT : APPLIED CALCULAS

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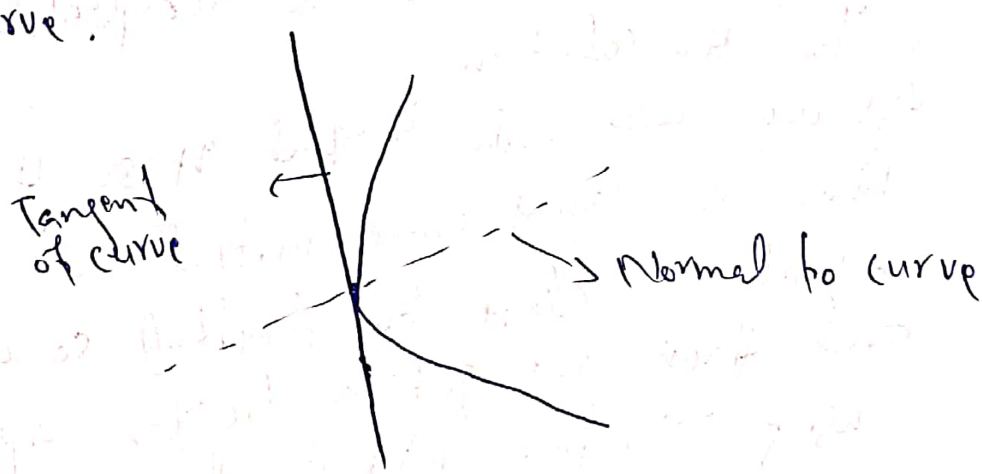
=> We use the derivative to determine the maximum and minimums values of particular functions (e.g cost, strength amount of material used in building, Profit, loss etc)

=> Derivation are met in many engineering and science Problems, especially when modeling the behavior of moving objects our discussions begins with some general applications which we can then apply to specific problems.

=> Application of Derivatives

① Tangent And Normal : A tangent to a that touches the curve is a line that touches the curves is a line and has the same ~~slo~~ slope as the curve is a line perpendicular to a tangent of the curve.



Note: We can find the slope of a tangent at any point (x, y) using dy.

— Tangent: If we are traveling in car around a corner and we ~~are~~ drive over same thing slippery on the road like oil, water and our car starts to slide it will continue in a direction tangent to the curve.

— Normal: The spokes of the wheel are placed normal to the circular shape of the wheel at each point where the spoke connects with center.

— Newton's Method: The process involves making a guess at the time solution and then applying a formula to get a better guess and so on until we arrive at an acceptable approximation for the solution.

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

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

(3) Related Rates: If two variables both vary with respect to time and have a relation between them, we can express the rate of change of one in terms of one another. That is we will be finding $\frac{df}{dt}$ for some function.

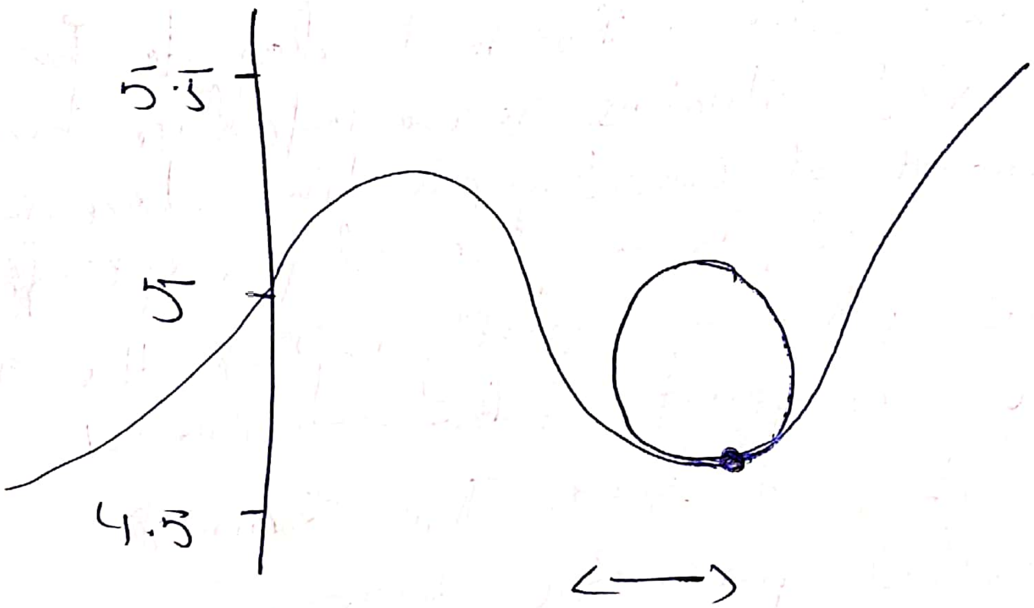
(4) Curviliner Motion: $V = \frac{ds}{dt}$ $a = \frac{dv}{dt} = \frac{d^2s}{dt^2}$

These formulas are only appropriate for rectilinear motion (velocity and acceleration in a straight line). This is inadequate for most real situations. 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,

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

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



=> Applicatin of Integration.

Integration: The process of finding a function given its derivative is cld integration or ~~ant~~ anti differentiation.

=> If $F'(x) = f(x)$ we say $F(x)$ is an anti-derivative of $f(x)$

It is usually used to find the area.

=> Shear Force And Bending moment

=> Shear force and bending moment are one of the important parameter for structural design these parameter affect a structure alot

=> Take example of a rod suspended between two horizontal supports and some load is applied at the ~~beam~~ width center of the beam the beam will bend.

=> Some force will develop inside the rod which will try to break the rod. In direction of force that force is cld shear force and product of that force with distance from either end is cld bending moment.

② Length of curve: Corrugated iron sheeting

$\Rightarrow$ Corrugated iron is used extensively through ~~~~ out the world as a versatile building material. Bending the material into a regular sine wave pattern gives it greater strength than if a flat sheet is used. So integration is used to find out how wide should the flat sheet be to give up a corrugated sheet of required width.

③ Area under a curve by integration

In civil engineering when we 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

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

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4) Moment of Inertia by ~~Int~~ Integration

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

⇒ 2 moment of inertia about x-axis

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

where y is the y coordinate of the differential element of Area dA

⇒ 2 moment of inertia about y-axis

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

where x is the x-coordinate of element dA.

(5) Centroid of an area by Integration:

=> In tilt slab construction we have a concrete wall ~~wheel~~ (with doors and windows cut out) 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 sides. then we will extend the concept to area with curved sides where we will use integration.