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Application Of Derivatives And Integration In Engineering

Derivatives: The derivative of a function $y = f(x)$ of a variable x is a measure of the rate at which the value y of the function changes with respect to the change of the variable x . It is called the derivative of f with respect to x .

Application Of Derivative In Engineering:

Differentials are an integral part of civil engineering. They are highly used in engineering mechanics but not you will find their applications in almost all the courses in civil engineering. To make things short and clear, the formulas and tables that you see in the building codes are actually derived using continuous mechanics. Other applications include fluid mechanics which involve the spatial and material description of motion (Eulerian and Lagrangian) in earthquake engineering (Structural Dynamics) where you

deal with random and time dependent loads. or most simple use is in writing the moment-curvature relationship with which is the pivot point of structural engineering.

we use the derivative to determine the maximum and minimum values of particular functions like eg cost, strength, amount of material used in a building, profit, loss etc.

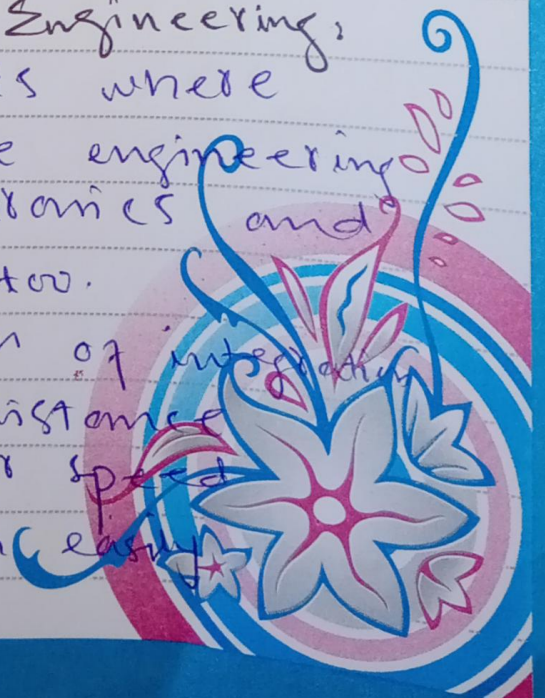
Integration: → the inverse process of differentiation.

→ Mathematically, it is the total value or summation of $f(x) dx$ over a range of x . In fact the integration symbol is actually a stylized capital S intended to signify the connection b/w integration & summation.

Application of Integration in Engineering;

there are many fields where integration is used like engineering, physics, economics, electronics and even in daily life too.

A very useful application of integration is in the field of distance or displacement, velocity or speed and acceleration. we can easily



find out an expression of displacement by integrating velocity and an expression of velocity by the given acceleration i.e. Displacement from velocity and velocity from acceleration.

In electrical engineering, integration is used to determine the exact length of power cable needed to connect two substations, which are miles away from each other. Space flight engineers frequently use integration when planning for long missions.

Integration used in;

- Area b/w curves.
- Distance, velocity, Acceleration
- Volume
- Average value of a function
- work
- center of mass
- Kinetic energy, improper integrals
- Probability
- Arc length
- Surface Area.