ASSIGNMENT

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SUBJECT APPLIED Calculus

(1)

Applications of Derivatives in engineering

(1) Rate of change of quantity:: This is the general and most important application of derivative. to check the rate of change of volume of cube with respect to its decreasing sides. we can use the derivative form as dy/dx. where dy/~~dt~~ represent the rate of change of volume of cube and dx represents the change of sides of cube

(2) Increasing and decreasing functions:: To find the given function is increasing or decreasing or constant, say in a graph we use derivatives. if f is a function which is continuous in $[p,q)$ and differential in the open interval (p,q) then,

- f is increasing at $[p,q]$ if $f'(x) > 0$ for each $x \in [p,q]$
- f is decreasing at $[p,q]$ if $f'(x) < 0$ for each $x \in [p,q]$
- f is constant function in $[p,q]$ if $f'(x) = 0$ for each $x \in [p,q]$

(3) Tangents and normals:- we often needs tangents and normals to curves when we are analysing forces on a moving body
A tangent to curve is the line that touches the curve at one point and has same slope as the curve at that point
A normal to the curve is a line perpendicular to a tangent ; to the curve.
we can find the slope of tangent at any point (x,y) using $\frac{dy}{dx}$
To find the equation of a normal.

$$m_1 \times m_2 = -1$$

(4) Newton's method for solving equation:-
Computers use itterative methods to solve equation the process involve making a guess at the true solution and the applying a formula to get a better guess and so until we arrive at an acceptable approximation for the solution.

(3) If we wish to find x so that $f(x) = 0$ (a common type of problem) then we guess some intial value x_0 which is close to the desired solution the we get better appraximation using newton method

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

(4) maxima and minima:- To calculate the highest and lowest point of the curve in a graph or to know it turning point, the derivative function is used

(5) Monotonicity:- Function are said to be monotonic if they are eithe increasing or decreasing in their entire domain. $f(x) = e^x$, $f(x) = n^x$, $f(x) = 2x+3$ are some function which are said to be increasing or dereasing in their entire domain are said to be non-monotanic example: $f(x) = \sin x$, $f(x) = x^2$

4)

(5) Approximation or finding approximate value:- To find very small change or variation of quantity we can use derivative to give the approximate value of it the approximate value represented by Δ suppose the change in the value x, $dx = x$ then

$dy/dx = \Delta x = x$

since then the change in x_1

$dx = x$ therefore $dx \simeq \Delta y$.

(6) Point of inflection:-

For continious function $f(x)$, if $f''(x_0) = 0$ or $f''(x_0)$ does not exist at points where $f'(x_0)$ exists and if $f''(x)$ changes sign when passing through $x = x_0$ then x_0 is called the point of inflection.

(5)

Application of integration in engineering

(1) Area between the curves:..

we have seen how integration can be used to find the area between the curves and the x-axis. with very little change we can find some areas between the curves. indeed the area between the curve and x-axis may be interpreted as the area between the curve and the 'second' curve with equation y=0. in the simplest of cases the ideas is quite easy to understand

(2) Volume :-

volume of complicated shapes can be calculated using integeral calculus if formula exists for the shapes boundary.

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(3) Shear force and bending movement:

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

Take example of a rod suspended between two horizontal supports and same load is applied at the center with application of load beam will beam

Some forces will develop inside the rod which will try to break the rod

(4) Area under the curve:

In civil engineering we are dealing with curve or structure having curves the we may need to find the are under the curve which is to be construt so we use integration for this

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

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(7)

(5) Average value of function:

of some finite set. A. Average value is a familiar concept. For example the class score on the quiz are 10, 9, 10, 8, 7, 6, 7, 6, 3, 2, 7, 8 then the average score is the sum of these numbers divided by the size of class.

(6) center of mass:-

Suppose a beam is 10m long and there are three weights on it an 10 kg weigth 3m from the left end, a five (5) kg wg 6m from the left end and a 4 kg wg 8m from the left. end where should be falcrum be placed so that the be should be balanced? lets assign a scale to the beam from 0 to left end ~~end~~ to 10 to right end so we can simply denote locations on the beam as x coordinate. the weigts are $x=3$, $x=6$, $x=8$

7) Radius of curvature

The radius of curvature $= \left[1+\left(\frac{dy}{dx}\right)^2\right]^{1/2}$

The radius of the curvature of the curve at particular curve is defined as the radius of approximity. this radius changes as we move along the curve the formular for the radius of curvature at any point x for the curve $y = f(x)$