ODM EDUCATIONAL GROUP
Changing your Tomorrow

Application of Derivatives

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 6
CHAPTER NAME : Application of Derivatives

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What we expect to learn?

- Students will learn about, how to find rate change of one quantity with respect to other quantity.
- Students will learn about, how to check whether a given function is increasing or decreasing or neither on the given interval. Also when function is given for what values function increases and for what value it decreases.
- Students will learn about finding tangents and normal to the given curves at particular point. Also learn learn about finding, if two given curves are orthogonal to touch each other.
- Students will learn about, finding approximate values of given expression using differentials.
- Students will learn about, finding Maxima and minima of a function, absolute maximum and minimum value of a function using first and second derivative and it use in day to day application.

Rate of change of bodies

Let $y = f(x)$ be a function of x . Let Δy be the change in y corresponding to small change Δx in x. .

In other words $\frac{\Delta y}{\Delta x}$ represents the average rate of change of y with respect to x as x to $x+\Delta x$. .

As $\Delta x \to 0$, the limiting value of this average rate of change of y w. r. t. x In the interval $[x, x + \Delta x]$ becomes the instantaneous rate of change of y w. r. t. x.

Thus, $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$ = instantaneous rate of change of y w. r. t. x.

$\Rightarrow \frac{dy}{dx}$ = rate of change of y w. r. t. x.

Problems on rate of change

Problem-1

Find the rate change of the area of the circle w. r. t. its radius. How fast the area changing with respect to the radius when the radius is 3cm?

Problem-2

The total cost C(x) associated with the production of x units of an item given by $C(x) = 0.005x^2 - 0.02x^2 + 30x + 5000$. Find the marginal cost when 3 units are produced, where the marginal cost we mean the instantaneous rate of change of total cost at any level of output.

Problem-3

A particle moves along the curve $6y = x^3 + 2$. Find the point on the curve at which the y- coordinate is changing 8 times as fast as the x- coordinate.

Problem- 4

A ladder 5cm long is leaning against a wall. The bottom of the ladder is pulled along the ground, away from the wall, at the rate of 2 cm/sec.How fast its height on the wall decreasing when foot of the ladder is 4cm away from the wall?

Problem-5

Sand is pouring from a pipe at the rate of 12 cm^3/s . The falling sand forms a cone on the ground in such a way that the height of the cone is always one sixth of the radius of the base. How fast is the height of the sand cone increasing with the height is 4 cm?

Problem-6

The length of the rectangle is decreasing at the rate 3 cm/ minute and the width y is increasing at the rate of 2cm/minute. When x = 10 cm and y = 6cm , find the rate change of

(a) The perimeter (b) the area of the rectangle.

HOME ASSIGNMENT

Q1. A balloon which always remains spherical, has a variable diameter $\frac{3}{2}(2x+1)$. Find the rate change of its volume.

Q2. The total revenue in in Rupees received from the sale of x units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue when $x = 7$.

Q3. The volume of a cube is increasing at a rate of $\frac{7cm^3}{Sec}$. How fast is the surface area increasing when the length of an edge is $12cm$?

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