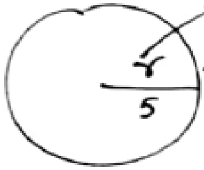
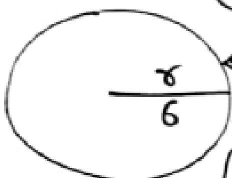
Application of Derivative



$\leftarrow 2\pi(5) = 10\pi$

$r \rightarrow$ Change $\rightarrow$ Perimeter:-

$\dfrac{dr}{dt}$



$\leftarrow 12\pi$

$\rightarrow P$

$\dfrac{dP}{dt}$

Derivative $\rightarrow$ Displacement $\rightarrow$ x $\rightarrow$ Diff. wrt $t \rightarrow$ time

$\downarrow$

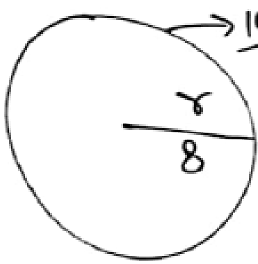
Continue

$\downarrow$

[Change in Dis. wrt time.] $\leftarrow \dfrac{d(x)}{dt} \Rightarrow \dfrac{dx}{dt} = V$

$\rightarrow f(x)$

Chapter-6 Application of Derivation



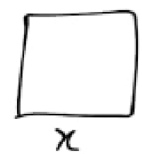
$\rightarrow 16\pi$

$t \leftarrow$ Diff. $\leftarrow y \rightarrow$ diff. $\rightarrow$ wrt x

$\dfrac{d}{dt}(y) = \dfrac{dy}{dt}$ $\qquad$ $\dfrac{d}{dx}(y) \Rightarrow \dfrac{dy}{dx}$

$\dfrac{dA}{dt}$

$\dfrac{dV}{dt}$



$\rightarrow$ Area $\rightarrow \Delta A$ (A)

$\dfrac{dA}{dx}$

$x \downarrow \Delta x$

$r \rightarrow$ Change

$\rightarrow V \Rightarrow$ Volume

Application of Derivative

Ex:- find change in Area of a circle wrt r:-

i) $r = 7$ cm   ii) $r = \frac{7}{2}$ m

Sol^n:- ∵ $\text{Area} = \boxed{\pi r^2 = A} \to$ change

→ diff A wrt r ⇒ $\frac{d(A)}{dr} = \frac{d}{dr}(\pi r^2)$

$$\Rightarrow \boxed{\frac{dA}{dr} = \pi \cdot 2r}$$

i) $\left.\frac{dA}{dr}\right|_{r=7} = \pi \cdot 2 \cdot (7) = 14\pi$

Ex:- Volume of a cube is increasing at a rate of $\boxed{9\ cm^3/sec}$ How fast its area increasing when the length of an edge is $\boxed{10\ cm}$

Sol^n:- ∵ Volume of a cube ⇒ $\boxed{V = x^3}$ —(i)

given:- $\boxed{\frac{dV}{dt} = 9\ cm^3/sec.}$ —(ii)

Let area of cube ⇒ $\boxed{A = 6x^2}$

find:- $\frac{dA}{dt} = ?$ → at $\boxed{x = 10}$

Sol^n:- $\frac{d}{dt}(6x^2) \Rightarrow 6 \cdot 2x \times \frac{dx}{dt}$

$\left(\frac{dA}{dt}\right)_{x=10} \Rightarrow 12 \times 10 \times \frac{dx}{dt}$ —(3)

from (1) & (2):- $\frac{d(x^3)}{dt} = 9 \Rightarrow \cancel{3}x^2 \cdot \frac{dx}{dt} = \cancel{9}^{3} \Rightarrow \boxed{\frac{dx}{dt} = \frac{3}{x^2}}$

⇒ So: from (3):- $\frac{dA}{dt} = 120 \times \frac{3}{x^2} = 120 \times \frac{3}{100} = \frac{36}{10} = 3.6\ cm^2/sec.$ Ans