AOD

Ex:- the Radius of a circle increasing uniformly at a rate of 3 cm/sec. Find the Rate at which area is increasing when $r = 10$ cm.

Soln:- let Radius of circle $\to r$

given :- $\left[\frac{d(r)}{dt} = 3 \text{ cm/sec.}\right]$

find :- $\left[\frac{d(A)}{dt} = ? \text{ at } r = 10\right]$

$\Rightarrow$ $\because$ Area of circle $\Rightarrow [A = \pi r^2]$

$\Rightarrow$ Diff wrt $\to t \to \frac{d(A)}{dt} = \frac{d(\pi r^2)}{dt}$

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

$$\left.\frac{dA}{dt}\right|_{r=10} = \pi \cdot 2 \cdot 10 \cdot 3 = 60\pi \text{ cm}^2/\text{sec.}$$

AOD

Ex:- An edge of a cube increasing at 3cm/sec. How fast Volume increasing when edge = 10 cm long.

Soln:- given: let edge of cube = x $\Rightarrow \frac{dx}{dt} = 3$ cm/sec.

find:- let Volum of cube $\Rightarrow V \Rightarrow \frac{dv}{dt} = ?$

So:- Volume of cube :- $\rightarrow [V = x^3] \rightarrow$ Diff wrt $\rightarrow t \rightarrow$

$\Rightarrow \frac{d}{dt}V = \frac{d}{dt}(x^3) \Rightarrow \left[\frac{dv}{dt} = 3 \cdot x^2 \cdot \frac{dx}{dt}\right] = 3 \cdot (10)^2 \cdot 3 = 900 \text{ cm}^3/\text{sec}$

Ex:- Reading of circle is increasing at 0.7 cm/sec what is the rate of increase of its circumference

Ex:- A ballon, which remain spherical on inflation, is being inflated by pumping in 900 (cm^3) of gas per second find Rate at which Reading of ballon increasing when $r = 15$cm

Soln:- given: $\frac{dV}{dt} = 900 \text{ cm}^3/\text{sec}$, find:- $\frac{dr}{dt} = ?$, $\because$ Volume of Sphere $\Rightarrow V = \frac{4}{3}\pi r^3$

So: $\frac{d}{dt}\left(\frac{4}{3}\pi r^3\right) = 900 \Rightarrow \frac{4}{3}\pi \cdot 3r^2 \times \frac{dr}{dt} \Rightarrow \frac{dr}{dt} = 900 \times \frac{3}{4\pi} \times \frac{1}{3 \cdot (15)^2} = \frac{\cancel{900} \times \cancel{3}}{4\pi} \times \frac{1}{\cancel{3} \times \cancel{225}}$

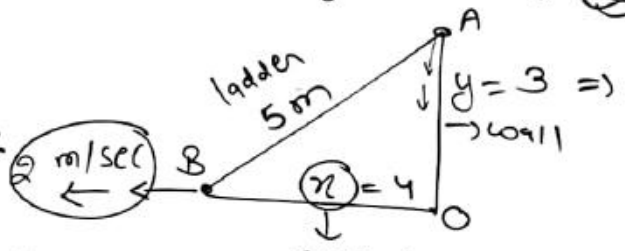
$\Rightarrow \left[\frac{dr}{dt} = \frac{1}{\pi} \text{ cm/sec}\right]$ Ans

AOD

Ex:- a stone is droped into lake & waves move in circle at speed of 5cm/sec. at instant when $r = 8$ cm, How fast area increasing.

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

Soln:- let AB is ladder in which A is point on wall & B on Grnd.



let:- $OA = y$ m & $OB = x$ m

given $\frac{dx}{dt} = 2$ cm/sec. ; find $= \frac{dy}{dt} = ?$

$\Rightarrow \because$ AOB is Right Δ. $\Rightarrow x^2 + y^2 = 25 \Rightarrow$ Diff. wrt $\rightarrow t$

$\because x = 4$ m & $y = \sqrt{(5)^2 - (4)^2} = \sqrt{9} = 3$m

$\Rightarrow 2x \cdot \frac{dx}{dt} + 2y \cdot \frac{dy}{dt} = 0 \Rightarrow 2 \cdot 4 \times 2 + 2 \cdot 3 \cdot \frac{dy}{dt} = 0$

$\Rightarrow \frac{dy}{dt} = -\frac{16}{6} = -\frac{8}{3}$ cm/sec.