AOD

Error

given → $\underline{r} \to \Delta r$

find → $V \to \Delta V$

Approximation

Error, Approx. error, Change, Approx.change $\sqrt{27} = ?$

Relative Error :- $\underline{y} \to \boxed{\dfrac{\Delta y}{y}}$

$$\frac{\Delta V}{V}, \frac{\Delta r}{r}$$

% Relative error → $\dfrac{\Delta V}{V} \times 100\%$

AOD

Ex:- find the approx. change in the SA of a cube of side x m caused by decreasing the side by 1%.

Solⁿ:- Let side of cube $= x$ m., & surface Area of cube $= A$

change in side of cube $\Rightarrow \boxed{\Delta x = -0.01x}$ $\left[1\% \text{ of } x = x \times \frac{1}{100} = 0.01x\right]$

So find:- $\Delta A = ?$

∵ we know:- $\frac{\Delta A}{\Delta x} = \frac{dA}{dx}$ — (1)

Now: $\boxed{A = 6(x)^2} \rightarrow$ Diff $\rightarrow \boxed{\frac{dA}{dx} = 12x}$

so from eqⁿ (1):- $\Delta A = \Delta x \times 12x = 0.01x \times 12x = -0.12x^2\ m^2$ Ans.

$$\begin{array}{r} 99 \\ 99 \\ \hline 891 \\ 891\times \\ \hline 9801 \\ \hline 6 \\ \hline \end{array} \qquad \begin{array}{r} 58806 \\ \hline \end{array}$$

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for Ex:- old $x =$ side $= 100$ cm

change $\rightarrow 1\% \rightarrow$ new side $= 99$ cm

old area $= 6 \times (100)^2 = \boxed{60000}$ cm²

new area $= 6 \times (99)^2 = 58806$ cm²

$\boxed{1194}$ cm²

$\Delta A =$ Change $= 0.12x^2 = \frac{0.12 \times 100 \times 100}{100}$

$= 1200\ m^2$

$1194 \simeq 1200$

AOD

Ex: if the Radius of a sphere is measured as 7 m with an error of 0.02 m, then find app. error in calculating its volume.

Sol.:- let radius of sphere → $r = 7\,m$ & $\Delta r = 0.02\,m$

⇒ find → error in volu. → $\Delta V = ?$

⇒ ∵ vol. of sphere $= \frac{4}{3}\pi r^3 = V$ → diff ⇒ $\frac{dv}{dr} = \frac{4}{3}\pi \cdot 3 \cdot r^2$

$$\boxed{\frac{dv}{dr} = 4\pi r^2}$$

Formula :- $\frac{\Delta v}{\Delta r} = \boxed{\frac{dv}{dr}}$

So $\Delta V = \Delta r \times \frac{dv}{dr}$

$= 0.02 \times 4\pi r^2$ 7

$= 0.02 \times 4 \times \pi \times (7)^2 = 0.08 \times 49 \times \pi$

$= \boxed{3.92\pi}\,m^3$ Ans

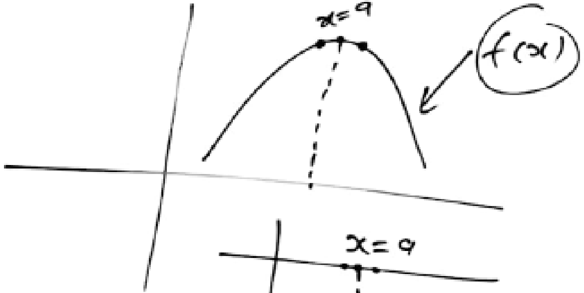
$3.92 \times 3.14 = 12$

AOD

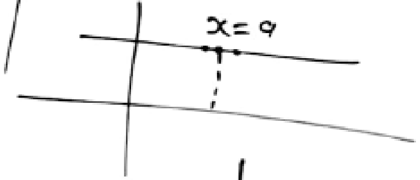
Local Maxima :- (maxima) :→

$f(x)$

at $\boxed{x = a}$ $f(a) \geq f(x)$

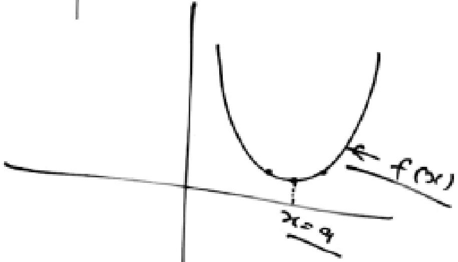


$y = f(x)$ is said to have local maxima at $x = a$ if value of fun. at $\boxed{x=a}$ is greater than or equal to values of fun. in some neighbourhood of $x = a$



Local minima (minima) :→ $y = f(x)$ is said to have local minima at $x = a$ if value of fun at $x = a$ is less or equal to the value of fun. in some neighbourhood of $\boxed{x=a}$

So: at $x = a \Rightarrow f(a) \leq f(x)$



$f(a) \leq f(x)$

Local max. and local minima together referred as local Extreme Value or local extremum.