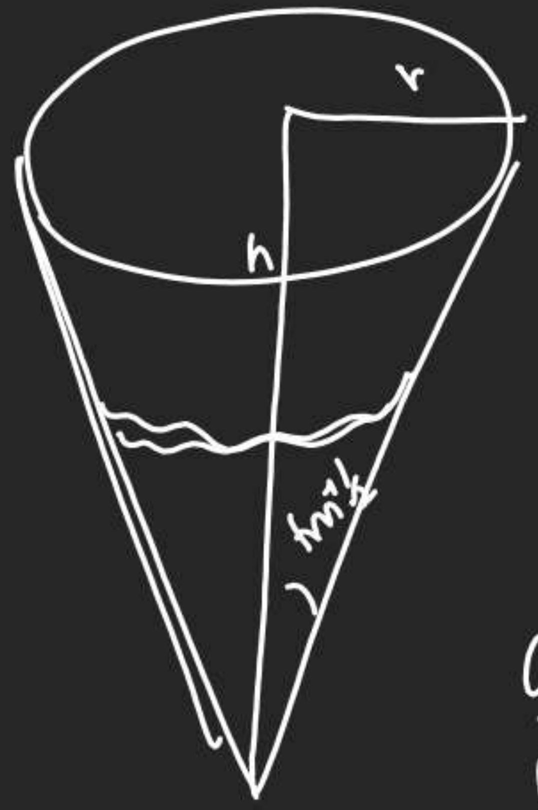
Nishant Jindal

Q A Water tank has a shape of Inverted Circular Cone with Semivertical angle $\tan^{-1}\frac{1}{2}$. Water is poured into it at a constant rate of $5\,m^3/min$. The rate at which the level of water is rising at the instant when depth of water is $\boxed{10m}$ is given.

Jee mains



$$\frac{r}{h} = \frac{1}{2}$$

$$r = \frac{h}{2}$$

$$V = \frac{\pi}{3} r^2 h = \frac{\pi}{3\times 4} h^3$$

$$\frac{dV}{dt} = \frac{\pi}{\cancel{12}_{4}} \times \cancel{3}h^2 \frac{dh}{dt}$$

$$5 = \frac{\pi}{4} \times \overset{25}{\cancel{100}} \times \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{1}{5\pi}$$

Q2 If Surface area of Cube is ↑ing @ of $3.6\,cm^2/sec$ retaining its shape, then the rate of change of its volume when length of side is 10cm?

Jee mains

① $S = 6a^2$

$$\frac{dS}{dt} = 12a\frac{da}{dt}$$

$$3.6 = 12\times 10 \times \frac{da}{dt} \Rightarrow \frac{da}{dt} = .03\,cm^2/sec.$$

$$V = a^3$$

$$\frac{dV}{dt} = 3a^2 \cdot \frac{da}{dt}$$

$$= 3\times 100 \times \frac{.03}{100}$$

$$= 9$$

Nishant Jindal

Q Sperical balloon is filled with 4500π Cubic meter of helium gas. If a leak in balloon causes the gas to escape @ 72π m³/min then the rate at which the balloon decreases 49 min after the leak began is?

Jee main.

$V = 4500\pi\, m^3$

$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dt} = \frac{4}{3} \times \pi \times 3r^2 \cdot \frac{dr}{dt}$

$72\pi = 4\pi \cdot 81 \cdot \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{2}{9}\ \frac{m}{min}$

1 Min → $72\pi\, m^3$

49 Min → $72\pi \times 49$

$= 3528\pi\, m^3$

Remaining gas $= 4500\pi - 3528\pi$

$\frac{4}{3}\pi r^3 = 972\pi$

$r^3 = \frac{972 \times 3}{4}$

$= 3^6 = 9^3$

$\boxed{r = 9\ m}$

Q A Water tank has a shape of Rt Circular Cone with its Vertex down. Its altitude is 10cm & radius of base is 15cm. Water leaks out of the bottom at the Rate 1 cm³/sec. Water is Poured into it at a Rate of "C" cm³/sec. Compute "C" so that water level will be rising @ 4 cm/sec at the instant When the water is 2 cm deep.

① $\frac{r}{h} = \frac{15}{10} \Rightarrow r = \frac{3h}{2}$

② $V = \frac{\pi}{3} r^2 h = \frac{\pi}{3} \times \frac{9h^2}{4} \times h = \frac{3\pi}{4} h^3$

$\frac{dV}{dt} = \frac{3\pi}{4} \times 3h^2 \frac{dh}{dt}$

$C - 1 = \frac{9\pi}{4} \times 4 \times 4$

$C = 1 + 36\pi$

Nishant Jindal

Q A Circular Ink blot grows @ $2\,cm^2/sec$

Find the Rate at which Radius is ↑

after $2\frac{6}{11}$ sec.

$A = \pi r^2$

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

$2 = 2 \times \frac{22}{7} \times \frac{14}{11} \times \frac{dr}{dt}$

$\frac{dr}{dt} = \frac{1}{4}\ cm/sec.$

$1\ sec \rightarrow 2\ cm^2$

$\frac{28}{11}\ sec \rightarrow \frac{56}{11}\ cm^2$

$\frac{22}{7} \times r^2 = \frac{56}{11}$

$r^2 = \frac{56 \times 7}{\frac{22 \times 11}{11}}$

$r = \frac{2 \times 7}{11} = \frac{14}{11}$

Approximation

Bina Limit का RAD सोचो

$h \rightarrow \delta x$ $\quad f'(x) = \frac{f(x+h) - f(x)}{h}$

$f'(x) \cdot h = f(x+h) - f(x)$

$f(x+h) \simeq f(x) + f'(x) \cdot h$

$180^\circ — \pi^c$

$1^\circ — \frac{\pi^c}{180}$

fxn मे जिस value को आप जानते है तो f(x) है

अगर value उस value से थोड़ी Shift है

जब then $\boxed{\text{Nyi value} = \text{old known value} + f'(x) \times \text{shifting}}$

Q find Approx. value of $\tan 44^\circ$

$\tan 44^\circ \simeq \tan 45^\circ + \sec^2 45^\circ \times (-1^\circ)$

$\simeq 1 + 2 \times \left(-\frac{\pi}{180}\right) \simeq 1 - \frac{3.14}{90} \simeq \frac{86.86}{90} \simeq .965$

Nishant Jindal

$$\boxed{f(x+\delta x) \simeq f(x) + f'(x)\cdot \delta x}$$

Shift

Q Approx value of $\sqrt{25.2}$

$$\sqrt{25.2} \simeq \sqrt{25} + \frac{1}{2\sqrt{25}} \times (.2)$$

$$\simeq 5 + \frac{1}{10} \times .2$$

$$\simeq 5 + .02$$

$$\simeq 5.02$$

Q Approximate change in volume of a cube of side x meter caused by ↑ing the side by 4%?

$$V = x^3$$

$$dv = 3x^2 \cdot dx$$

$$= 3 \cdot x^2 \cdot (0.04x)$$

$$\simeq \frac{12}{100} x^3$$

$$\simeq .12\, x^3$$