Ques :- For each D.E find general solution :-

① $\left[\frac{dy}{dx} = \frac{1-\cos x}{1+\cos x}\right]$

$\Rightarrow \quad dy = \left[\frac{1-\cos x}{1+\cos x}\right] dx$

$\Rightarrow \quad dy = \left[\frac{\cancel{2}\sin^2 x/2}{\cancel{2}\cos^2 x/2}\right] \cdot dx$

$dy = \left[\tan^2 \frac{x}{2}\right] \cdot dx$

Integrate on both side

$\int dy = \int \tan^2 \frac{x}{2} \cdot dx$

$y = \int \left(\sec^2 x/2 - 1\right) \cdot dx$

$y = \int \sec^2 \frac{x}{2} \cdot dx - \int 1 \cdot dx$

$y = \frac{\tan \frac{x}{2}}{\frac{1}{2}} - x + c$

$y = 2 \tan \frac{x}{2} - x + c$ Ans

Qus:- $\boxed{y = e^{2x}(a+bx)}$

$\Rightarrow y' = e^{2x}[b] + (a+bx)\,e^{2x} \times 2$

$\Rightarrow y' = be^{2x} + 2e^{2x}(a+bx) = be^{2x} + 2y \Rightarrow \left[be^{2x} = y' - 2y\right]$

$\Rightarrow y'' = b \cdot e^{2x} \times 2 + 2 \cdot y'$

$\Rightarrow \left[y'' = 2be^{2x} + 2y'\right]$

$\Rightarrow y'' = 2[y' - 2y] + 2y'$

$y'' = 2y' - 4y + 2y'$

$\left[y'' = 4y' - 4y\right]$ A

Q Form D.E. of family of ellipse (Hyperbola) having foci on y-axis (x axis) & Centre at origin.

eq. $\rightarrow \dfrac{x^2}{b^2} + \dfrac{y^2}{a^2} = 1$

$\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$

Diff $\rightarrow \boxed{\dfrac{\cancel{2}x}{b^2} + \dfrac{\cancel{2}y \cdot y'}{a^2} = 0}$ — (1)

Diff $\rightarrow \dfrac{2}{b^2} + \dfrac{2[y \cdot y'' + y' \cdot y']}{a^2} = 0$

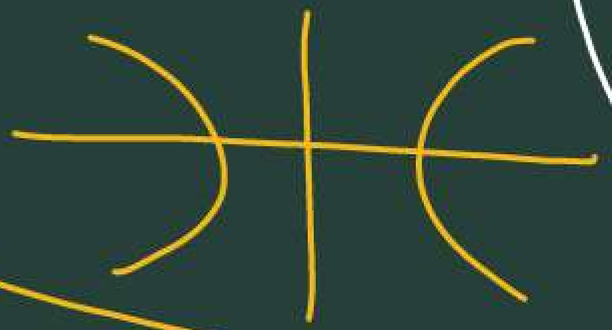
$\Rightarrow \dfrac{1}{b^2} + \dfrac{[y \cdot y'' + (y')^2]}{a^2} = 0 \Rightarrow \dfrac{1}{b^2} = -\dfrac{[y \cdot y'' + (y')^2]}{a^2}$ — (2)

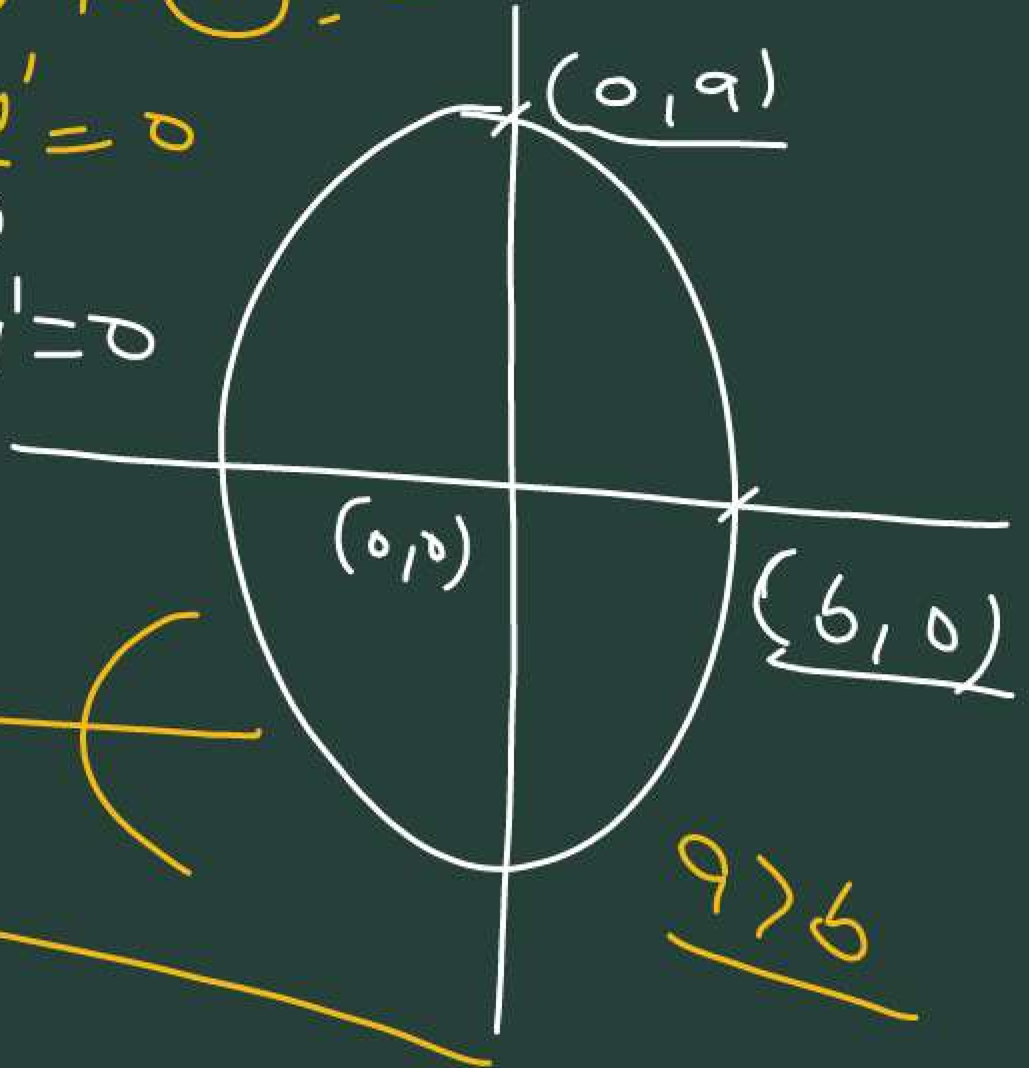
put value from (2) to (1) :-

$\Rightarrow -\dfrac{x}{a^2}[y \cdot y'' + (y')^2] + \dfrac{y \cdot y'}{a^2} = 0$

$\Rightarrow -xy \cdot y'' - x(y')^2 + y \cdot y' = 0$

So

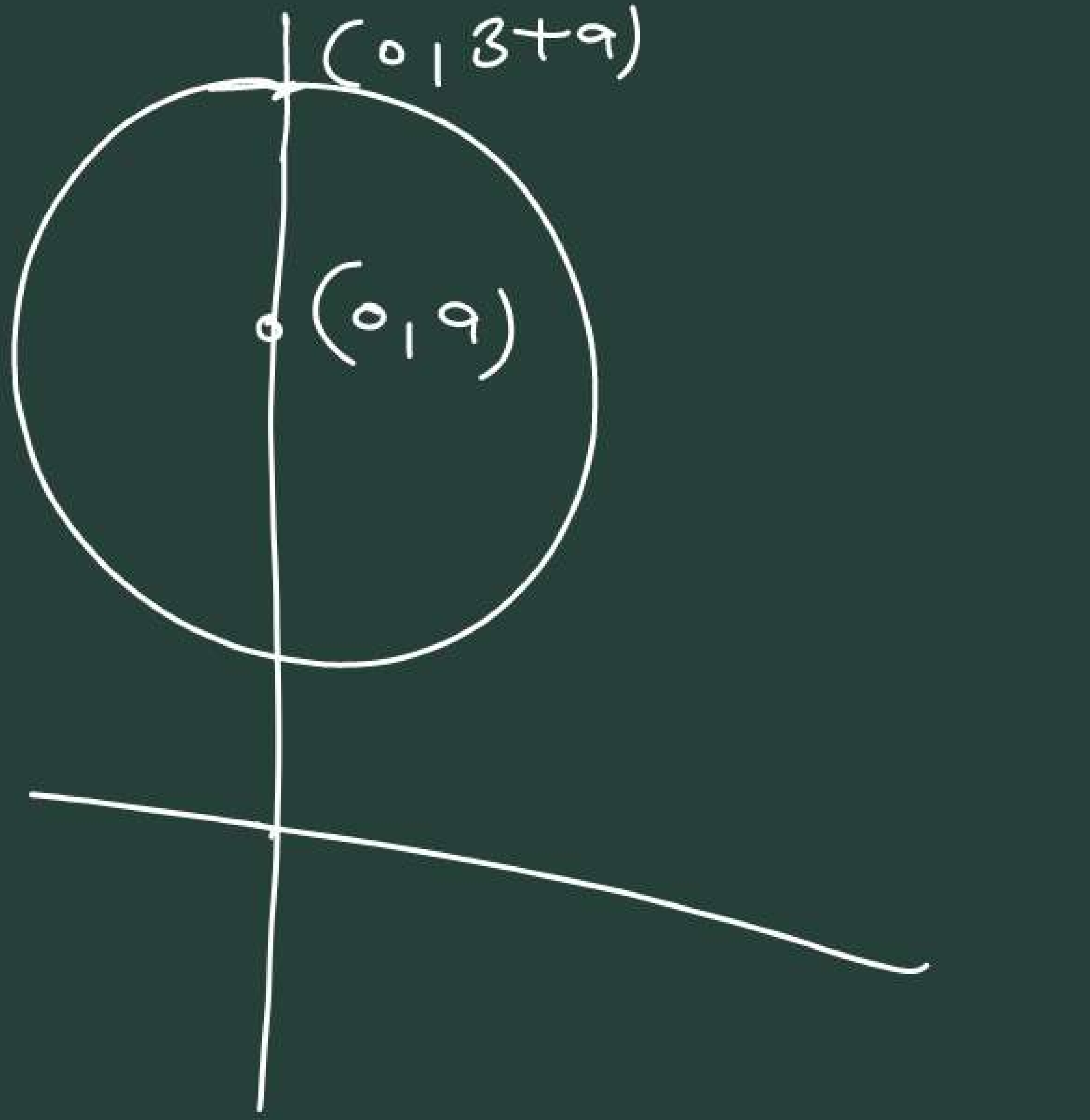




$a > b$

Que:- Form D.E. of family of circles having centre on y-axis & Radius $\boxed{3 \text{ unit}}$.

Sol^n: Centre → $(0, a)$, radius $= 3$



Eq. of circle:- $(x-a)^2+(y-b)^2=r^2$

$\Rightarrow (x-0)^2+(y-a)^2=(3)^2$

$\Rightarrow x^2+(y-a)^2=9$

$(x^2-9)(y')^2+x^2=0$

Ans:- $y = e^{x}[a\cos x + b\sin x] \longrightarrow y'' - 2y' + 2y = 0$

$\Rightarrow y' = e^{x}[-a\sin x + b\cos x] + \boxed{[a\cos x + b\sin x]e^{x}}$

$y' = e^{x}[-a\sin x + b\cos x] + y \Rightarrow e^{x}(-a\sin x + b\cos x) = y' - y$

Diff. again $\Rightarrow$ $y'' = e^{x}\boxed{[-a\cos x - b\sin x]} + \boxed{[-a\sin x + b\cos x]e^{x}} + y'$

$y'' = -\boxed{e^{x}[a\cos x + b\sin x]} + (y' - y) + y'$

$y'' = -y + y' - y + y'$

$y'' = 2y' - 2y$ Ans

Q. $\frac{dy}{dx} + y = 1$

$\frac{dy}{dx} = (1-y)$

$\Rightarrow dy = dx(1-y)$

$\left[\int \frac{dy}{1-y} = \int dx\right]$

$\Rightarrow -\log(1-y) = x + \log c$

$\Rightarrow -\log(1-y) - \log c = x$

$\Rightarrow -(\log(1-y) + \log c) = x$

$-[\log(1-y)\cdot c] = x$

$-\log(1-y)\cdot c = x$

$(1-y)\cdot c = e^{-x}$ Ans.

$$\int \sec^2 t \cdot 2\,dt = 2\int \sec^2 t \cdot dt$$

$$= 2\tan t + c$$

$$= \boxed{2\tan x/2 + c}$$

① $$\int \sec^2 x \cdot dx = \tan x + c$$

② $$\int \sec^2 \frac{x}{2} \cdot dx = 2 \cdot \tan \frac{x}{2} + c$$

$$\frac{x}{2} = t \Rightarrow \frac{dx}{2} = dt \Rightarrow dx = 2dt$$

A

$$\boxed{(y-1)\cdot C = e^{-x}}$$

$$\Rightarrow \frac{dy}{dx} + y = 1$$

$$\Rightarrow \frac{dy}{dx} = (1-y)$$

$$\Rightarrow \frac{dy}{1-y} = dx$$

$$\Rightarrow \frac{dy}{-(y-1)} = dx$$

$$\Rightarrow \int \frac{dy}{-(y-1)} = \int dx$$

$$\Rightarrow -\int \frac{dy}{y-1} = \int dx$$

$$\Rightarrow -\left[\log(y-1)\right] = x + \cancel{c}$$

$$\Rightarrow \left[-\log(y-1) = x + \log C\right]$$

$$\Rightarrow -\log(y-1) - \log C = x$$

$$\Rightarrow -\left[\log(y-1) + \log C\right] = x$$

$$\Rightarrow \log(y-1)\cdot C = -x$$

$$\Rightarrow (y-1)\cdot C = e^{-x}$$

Ans: $\sec^2 x \cdot \tan y \cdot dx = \sec^2 y \cdot \tan x \cdot dy = 0$

$$\int \frac{\sec^2 x}{\underbrace{\tan x}_{t}}\, dx = \int \frac{\sec^2 y}{\underbrace{\tan y}_{t}} \cdot dy$$

$\Rightarrow \log(\tan x) = \log(\tan y) + \log c$

$\cancel{\log}(\tan x) = \cancel{\log}(\tan y \cdot c)$

$\tan x = \tan y \cdot c$

Ans:- $\frac{dy}{dx} = \sqrt{4-y^2}$

Ans: $(e^x + e^{-x})\,dy - (e^x - e^{-x})\,dx = 0$

$(e^x + e^{-x}) \cdot dy = (e^x - e^{-x}) \cdot dx$

$$\int dy = \int \left(\frac{e^x - e^{-x}}{\underbrace{e^x + e^{-x}}_{t}}\right) dx$$

$y = \log(e^x + e^{-x}) + \log($

$\frac{\qquad}{y}$

$\mathcal{Q}$ $\quad \frac{dy}{dx} = (1+x^2)(1+y^2)$

$$\int \frac{dy}{1+y^2} = \int (1+x^2)\,dx$$

Ans:

$$y \log y \cdot dx - x \cdot dy = 0$$

$$y \log y \cdot dx = x \, dy$$

$$\int \frac{dx}{x} = \int \frac{dy}{y \cdot \log y} \longrightarrow \text{let } \log y = t$$

$$\frac{1}{y} \cdot dy = dt$$

$$\int \frac{1}{t} dt =$$

$$\log x = \log(\log y) + \log C$$

$$\cancel{\log} x = \cancel{\log} \left[(\log y) \cdot C \right]$$