

Q.2 Find the orthogonal trajectories of the family of curves (circles) with center $(0, 1)$.

Sol / The equation of this circle

$$x^2 + (y-1)^2 = r^2$$

$$2x + 2(y-1) \cdot y' = 0$$

$$y' = \frac{-x}{(y-1)}$$

The orth. Trajs.

$$\therefore \frac{dy}{dx} = \frac{y-1}{x}$$

diff. eq. of first order

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

$$\Rightarrow \ln|y-1| = \ln|x| + C$$

$$\ln|y-1| - \ln|x| = C$$

$$\frac{y-1}{x} = C^*$$

$$\therefore y = C^*x + 1$$

family lines