53. If $\operatorname{cosec}^{-1}(2^x)+\sec^{-1}(x^2)=\frac{\pi}{2}$ then number of solutions of this equation is 2

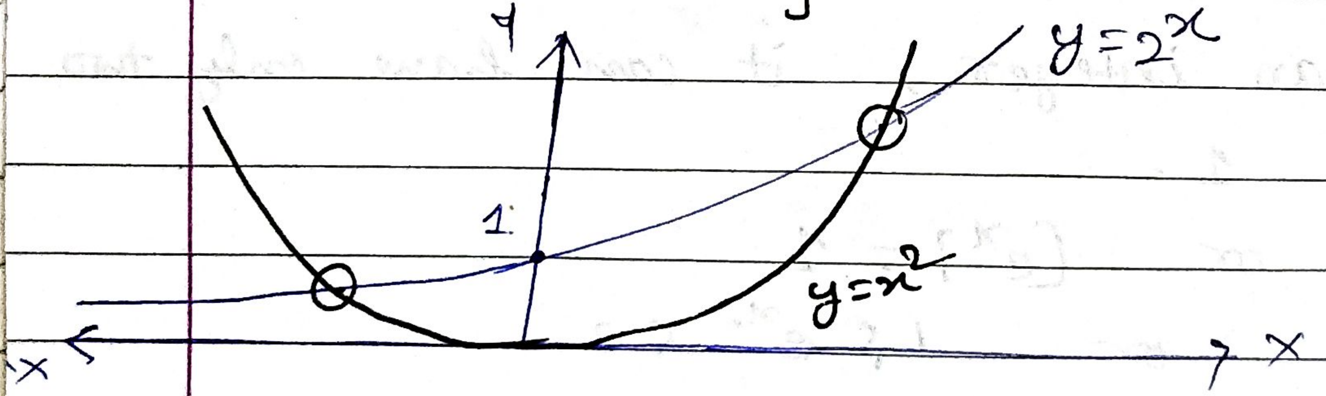
$$\operatorname{cosec}^{-1}(2^x) + \sec^{-1}(x^2) = \pi/2$$

$$\Rightarrow \operatorname{cosec}^{-1}(2^x) = \pi/2 - \sec^{-1}(x^2) = \operatorname{cosec}^{-1}(x^2)$$

$$(\because \sec^{-1}(x) + \operatorname{cosec}^{-1}(x) = \pi/2)$$

As $\operatorname{cosec}^{-1}$ is a bijective func; $\operatorname{cosec}^{-1}(2^x) = \operatorname{cosec}^{-1}(x^2)$ implies $2^x = x^2$.

The equation can't be solved analytically. So, we shall resort to graphical method [we are concerned only about number of solutions, not the exact solutions].



We see that there are 2 sol^n's.

Hence, answer is $\boxed{2}$.