

If 1,  $\log_9(3^{1-x}+2)$  and  $\log_3(4 \cdot 3^x - 1)$  are in AP;  
then  $x$  equals:

Solution:

$\therefore$  Given no's are in AP

$$\Rightarrow 2 \log_9(3^{1-x}+2) = 1 + \log_3(4 \cdot 3^x - 1)$$

$$\Rightarrow 2 \log_9(3^{1-x}+2) = \log_3(4 \cdot 3^x - 1) + \log_3 3$$

$$\Rightarrow \frac{2}{2} \log_3(3^{1-x}+2) = \log_3[3(4 \cdot 3^x - 1)]$$

$$\Rightarrow 3^{1-x} + 2 = 3(4 \cdot 3^x - 1)$$

$$\Rightarrow \frac{3}{3^x} + 2 = 12 \cdot 3^x - 3$$

$$\text{Let } 3^x = y$$

$$\Rightarrow \frac{3}{y} + 2 = 12y - 3$$

$$\Rightarrow 12y^2 - 5y - 3 = 0$$

$$\Rightarrow y = -1/3 \text{ or } 3/4$$

$$y = -1/3 \rightarrow \text{rejected}$$

$$\Rightarrow y = 3^x = 3/4$$

$$\Rightarrow x = \log_3(3/4) \Rightarrow \log_3 3 - \log_3 4$$

$$\therefore x = 1 - \log_3 4$$