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(Affiliated to CBSE up to +2 Level)

Class : x

Sub.: Maths (NCERT)

Date: 08.10.2020

EX : - 8.4

Prove that

$$(i) (\operatorname{cosec} \theta - \cot \theta)^2 = \frac{1 - \cos \theta}{1 + \cos \theta}$$

$$(ii) \frac{\cos A}{1 + \sin A} + \frac{1 + \sin A}{\cos A} = 2 \sec A$$

$$(iii) \frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \operatorname{cosec} \theta$$

$$(iv) \frac{1 + \sec A}{\sec A} = \frac{\sin^2 A}{1 - \cos A}$$

$$(v) \frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A, \text{ using the identity } \operatorname{cosec}^2 A = 1 + \cot^2 A.$$

$$(vi) \sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A$$

$$(vii) \frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta} = \tan \theta$$

$$(viii) (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$$

$$(ix) (\operatorname{cosec} A - \sin A) (\sec A - \cos A) = \frac{1}{\tan A + \cot A}$$

$$(x) \left(\frac{1 + \tan^2 A}{1 + \cot^2 A} \right) = \left(\frac{1 - \tan A}{1 - \cot A} \right)^2 = \tan^2 A$$

Sol. (i) L.H.S. = $(\operatorname{cosec} \theta - \cot \theta)^2$

$$= \left(\frac{1}{\sin \theta} - \frac{\cos \theta}{\sin \theta} \right)^2 = \frac{(1 - \cos \theta)^2}{\sin^2 \theta}$$

$$= \frac{(1 - \cos \theta)}{1 - \cos^2 \theta} \quad [\because \sin^2 \theta = 1 - \cos^2 \theta]$$

$$= \frac{(1 - \cos \theta) \times (1 - \cos \theta)}{(1 - \cos \theta) \times (1 + \cos \theta)} \quad [\because 1 - \cos^2 \theta = (1 - \cos \theta)(1 + \cos \theta)]$$

$$= \frac{1 - \cos \theta}{1 + \cos \theta} = \text{R.H.S.}$$

(ii) L.H.S. = $\frac{\cos A}{1 + \sin A} + \frac{1 + \sin A}{\cos A} = \frac{\cos^2 A + (1 + \sin A)^2}{(1 + \sin A) \cos A}$

$$= \frac{\cos^2 A + 1 + \sin^2 A + 2 \sin A}{(1 + \sin A) \cos A} = \frac{(\cos^2 A + \sin^2 A) + 1 + 2 \sin A}{(1 + \sin A) \cos A}$$

$$= \frac{1 + 1 + 2 \sin A}{(1 + \sin A) \cos A} \quad [\because \cos^2 A + \sin^2 A = 1]$$

$$= \frac{2 + 2 \sin A}{(1 + \sin A) \cos A} = \frac{2(1 + \sin A)}{\cos A (1 + \sin A)}$$

$$= \frac{2}{\cos A} = 2 \sec A = \text{R.H.S.} \quad \left[\because \frac{1}{\cos A} = \sec A \right]$$
