

MATHEMATICS.

B.Sc. Part-I (Maths. Honours)

Paper-I.

Name of the Topic:

Hyperbolic function (Trigo)

Some important formulae for Hyperbolic functions.

✓ 1. $\cosh^2 x - \sinh^2 x = 1$

we have for all values of θ ,

$$\cos^2 \theta + \sin^2 \theta = 1.$$

Hence putting $i\alpha$ for θ , it follows that $\cos^2(i\alpha) + \sin^2(i\alpha) = 1$

$$\Rightarrow (\cosh^2 x) + (i \sinh^2 x) = 1.$$

$$\text{i.e., } \cosh^2 x - \sinh^2 x = 1 \quad \text{--- (1)}$$

Or, $\cosh^2 x - \sinh^2 x$

$$= \left(\frac{e^x + e^{-x}}{2} \right)^2 - \left(\frac{e^x - e^{-x}}{2} \right)^2$$

$$= \frac{1}{4} \left\{ e^{2x} + e^{-2x} + 2 - e^{2x} - e^{-2x} + 2 \right\}$$

$$= \frac{1}{4} \times 4 = 1.$$

$$\text{II } \text{sech}^2 x + \tanh^2 x = 1$$

dividing (I) by $\cosh^2 x$,
we get, $1 + \tanh^2 x = \text{sech}^2 x$

$$\Rightarrow \text{sech}^2 x + \tanh^2 x = 1 \quad \text{--- (2)}$$

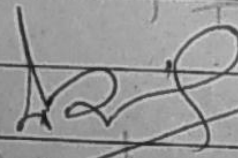
$$\text{III } \coth^2 x - \text{cosech}^2 x = 1.$$

Again, dividing (I) by
 $\sinh^2 x$, we get

$$\coth^2 x = 1 + \text{cosech}^2 x$$

$$\Rightarrow \coth^2 x - \text{cosech}^2 x = 1 \quad \text{--- (3)}$$

Note! - Of the three (1), (2)
and (3), first should be re-
membered, for the other two
can be derived from it in an
usual way.


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