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MATHEMATICS.

B. Sc. Part-I (Maths. Hon)  
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  $\theta$ ,  
 $\cos^2 \theta + \sin^2 \theta = 1$ .

Hence putting  $ix$  for  $\theta$ , it follows  
that  $\cos^2(ix) + \sin^2(ix) = 1$   
 $\Rightarrow (\cosh x)^2 + (i \sinh x)^2 = 1$   
i.e.,  $\cosh^2 x - \sinh^2 x = 1$  — (1)

Or,  $\cosh^2 x - \sinh^2 x$   
 $= \left( \frac{e^x + e^{-x}}{2} \right)^2 - \left( \frac{e^x - e^{-x}}{2} \right)^2$   
 $= \frac{1}{4} \left\{ e^{2x} + e^{-2x} + 2 - e^{2x} - e^{-2x} + 2 \right\}$   
 $= \frac{1}{4} \times 4 = 1$

$$\text{II} \quad \sec^2 x + \tan^2 x = 1$$

dividing (I) by  $\sec^2 x$ ,  
we get,  $1 + \tan^2 x = \sec^2 x$

$$\Rightarrow \sec^2 x + \tan^2 x = 1 \quad (2)$$

$$\text{III} \quad \cot^2 x - \operatorname{cosec}^2 x = 1$$

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

$$\cot^2 x - 1 = \operatorname{cosec}^2 x$$

$$\Rightarrow \cot^2 x - \operatorname{cosec}^2 x = 1 \quad (3)$$

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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