



MATHS

BOOKS - VIKRAM PUBLICATION (ANDHRA PUBLICATION)

HYPERBOLIC FUNCTIONS

Solved Problems

1. Prove that $\sinh(3x) = 3 \sinh x + 4 \sinh^3 x, \forall x \in R$



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2. P.T $\tanh 3x = \frac{3 \tanh x + \tanh^3 x}{1 + 3 \tanh^2 x}, \forall x \in R$

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3. If $\cosh x = 5/2$, then find the values of
 $\cosh(2x)$

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4. If $\cosh x = 5/2$, then find the values of
 $\sinh(2x)$

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5.

If

$\cosh x = \sec \theta$ then prove that $\tanh^2 \frac{x}{2} = \tan^2 \frac{\theta}{2}$



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6. If $\theta \in \left(-\frac{\pi}{4}, \frac{\pi}{4} \right)$ and $x = \log_e \left[\cot \left(\frac{\pi}{4} + \theta \right) \right]$

then prove that

(i) $\cosh x = \sec 2\theta$ (ii) $\sinh x = -\tan 2\theta$



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7. If $\theta \in \left(-\frac{\pi}{4}, \frac{\pi}{4} \right)$ and $x = \log_e \left[\cot \left(\frac{\pi}{4} + \theta \right) \right]$

then prove that

$$(i) \cosh x = \sec 2\theta \quad (ii) \sinh x = -\tan 2\theta$$



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8. If $\sinh x=5$, show that $x = \log_e (5 + \sqrt{26})$



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9. S.T $\frac{\tanh^{-1} 1}{2} = \frac{1}{2} \log_e 3.$



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Exercise 9 A

1. If $\sinh x = \frac{3}{4}$ then find $\cosh 2x$ and $\sinh 2x$.

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2. If $\sinh x = 3$, then show that $x = \log_e (3 + \sqrt{10})$.

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3. Prove that $\tanh(x - y) = \frac{\tanh x - \tanh y}{1 - \tanh x \tanh y}$

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4. Prove that $\coth(x - y) = \frac{\coth x \cdot \coth y - 1}{\coth y - \coth x}$



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5. Prove that

$$(\cosh x - \sinh x)^n = \cosh(nx) - \sinh(nx)$$



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6. Prove that

$$(\cosh x + \sinh x)^n = \cosh(nx) + \sinh(nx)$$



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7.
$$\frac{\tanh(x)}{\operatorname{sech}(x) - 1} + \frac{\tanh(x)}{\operatorname{sech}(x) + 1} =$$

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8. Prove that

$$\frac{\cosh x}{1 - \tanh x} + \frac{\sinh x}{1 - \coth x} = \sinh x + \cosh x, \quad \text{for } x \neq 0$$

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9. Prove that $\cosh^4 x - \sinh^4 x = \cosh 2x$

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10. If $x = \log \left[\tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right) \right]$ then $\cosh x =$

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