HYPERBOLIC FUNCTIONS

PREVIOUS EAMCET BITS

1. $\sinh^{-1}2+\sinh^{-1}3=x\Rightarrow\cosh x=$ **[EAMCET 2009]**

1) $\frac{1}{2}\left(3\sqrt{5}+2\sqrt{10}\right)$ 2) $\frac{1}{2}\left(3\sqrt{5}-2\sqrt{10}\right)$ 3) $\frac{1}{2}\left(12+2\sqrt{50}\right)$ 4) $\frac{1}{2}\left(12-2\sqrt{50}\right)$

Ans: 3

Sol. $\cosh x=\cosh\left(\sinh^{-1}2+\sinh^{-1}3\right)$

$=\frac{1}{2}\left(12+2\sqrt{50}\right)$

2. $\frac{1+\tanh\left(x/2\right)}{1-\tanh\left(x/2\right)}$ **[EAMCET 2008]**

1) e^{-x} 2) e^{x} 3) $2e^{x/2}$ 4) $2e^{-x/2}$

Ans: 2

Sol. $\frac{1+\tanh\left(\frac{x}{2}\right)}{1-\tanh\left(\frac{x}{2}\right)}=\frac{\cosh\left(\frac{x}{2}\right)+\sinh\left(\frac{x}{2}\right)}{\cosh\left(\frac{x}{2}\right)-\sinh\left(\frac{x}{2}\right)}=\frac{\left[\cosh\left(\frac{x}{2}\right)+\sinh\left(\frac{x}{2}\right)\right]^2}{\cosh^2\left(\frac{x}{2}\right)-\sinh^2\left(\frac{x}{2}\right)}$

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

3. $\sec h^{-1}\left(\sin\theta\right)=$ **[EAMCET 2007]**

1) $\log\tan\frac{\theta}{2}$ 2) $\log\sin\frac{\theta}{2}$ 3) $\log\cos\frac{\theta}{2}$ 4) $\log\cot\frac{\theta}{2}$

Ans: 4

Sol. $\sec h^{-1}\left(\sin\theta\right)=\log\left(\frac{1+\sqrt{1-\sin^2\theta}}{\sin\theta}\right)$

$=\log\left(\frac{1+\cos\theta}{\sin\theta}\right)=\log\left(\cot\theta/2\right)$

4. $e^{\log\left(\cosh^{-1}2\right)}=$ **[EAMCET 2006]**

1) $\log\left(2-\sqrt{3}\right)$ 2) $\log\left(\sqrt{3}-2\right)$ 3) $\log\left(2+\sqrt{3}\right)$ 4) $\log\left(2+5\right)$

Ans: 3

Sol. $e^{\log_e f(x)}=f\left(x\right)$

$e^{\log e^{\cosh^{-1}(2)}}=\cosh^{-1}\left(2\right)$

$=\log\left\{2+\sqrt{2^2-1}\right\}$

$=\log\left(2+\sqrt{3}\right)$

5. $2\tanh^{-1}\frac{1}{2}=$ **[EAMCET 2005]**

1) 0 2) log 2 3) log 3 4) log 4

Ans: 3

Sol. $\tanh^{-1}x=\frac{1}{2}\log\frac{1+x}{1-x}$

$\therefore\ 2\tanh^{-1}x=\log\frac{1+\frac{1}{2}}{1-\frac{1}{2}}=\log 3$

6. $x=\log\left[\cot\left(\frac{\pi}{4}+\theta\right)\right]\Rightarrow \sinh x=$ **[EAMCET 2004]**

1) tan2θ 2) – tan2θ 3) cot 2θ 4) –cot2θ

Ans: 2

Sol. $\sinh x=\frac{\cot\left(\frac{\pi}{4}+\theta\right)-\tan\left(\frac{\pi}{4}+\theta\right)}{2}=-\tan 2\theta$

7. $\sinh^{-1}\left(2^{3/2}\right)=\ldots\ldots$ **[EAMCET 2003]**

1) $\log\left(2+\sqrt{18}\right)$ 2) $\log\left(3+\sqrt{8}\right)$ 3) $\log\left(3-\sqrt{8}\right)$ 4) $\log\left(\sqrt{8}+\sqrt{27}\right)$

Ans: 2

Sol. $\sinh^{-1}\left(2^{3/2}\right)=\log\left(\sqrt{8}+\sqrt{1+8}\right)=\log\left(3+\sqrt{8}\right)$

8. $\sin h\, ix=$ **[EAMCET 2002]**

1) i sinx 2) sin (ix) 3) – sinx 4) i sin(ix)

Ans: 1

Sol. $\sinh(ix)=\frac{e^{ix}-e^{-ix}}{2}=\frac{(\cos x+i\sin x)-(\cos x-i\sin x)}{2}=i\sin x$

9. $\sec^2\left(\tan^{-1}2\right)+\operatorname{cosec}^2\left(\cot^{-1}3\right)=$ **[EAMCET 2001]**

1) 5 2) 10 3) 15 4) 20

Ans: 3

Sol. Let $\tan^{-1}(2)=\alpha$ and $\cot^{-1}(3)=\beta$

$\tan\alpha=2;\ \cot\beta=3$

$\Rightarrow \sec\alpha=\sqrt{5};\operatorname{cosec}\beta=\sqrt{10}$

$\therefore\ \sec^2\alpha+\operatorname{cosec}^2\beta=5+10=15$

10. $\cosh 2+\sinh 2=$ **[EAMCET 2000]**

1) 1/e 2) e 3) $1/e^2$ 4) e^2

Ans: 4

Sol. $\cosh 2+\sinh 2=\frac{e^2+e^{-2}}{2}+\frac{e^2-e^{-2}}{2}=e^2$

11. If $\cosh^{-1}x=\log_e\left(2+\sqrt{3}\right)$, then x = **[EAMCET 2000]**

1) 2 2) 1 3) 3 4) 5

Ans: 1

Sol. $\log\left[x+\sqrt{x^2-1}\right]=\log\left(2+\sqrt{3}\right)$

$\log\left[x+\sqrt{x^2-1}\right]=\log\left[2+\sqrt{(2)^2-1}\right]$

$\therefore x = 2$

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