Multiple choice questions - Hyperbolic functions

Year: Further Maths · 10

Question 1 $\cosh 0 =$

- **A.** 0
- **B.** 1
- **C.** e
- **D.** ∞

Question 2 $\sinh 0 =$

- **A.** 1
- **B.** 0
- **C.** -1
- **D.** e

Question 3 $\cosh^2 x - \sinh^2 x =$

- **A.** -1
- **B.** 0
- **C.** 1
- **D.** $\cosh 2x$

Question 4 $\frac{d}{dx}\cosh x =$

- **A.** $-\sinh x$
- **B.** $\sinh x$
- **C.** $\cosh x$
- **D.** $-\cosh x$

Question 5 $\frac{d}{dx}\tanh x =$

- **A.** $\operatorname{sech}^2 x$
- **B.** $\operatorname{cosech}^2 x$
- **C.** $-\operatorname{sech}^2 x$
- **D.** $1 + \tanh^2 x$

Question 6 $\operatorname{arsinh} x =$

- ◯ **A.** $\ln(x+\sqrt{x^2-1})$
- ◯ **B.** $\ln(x+\sqrt{x^2+1})$
- ◯ **C.** $\ln(x-\sqrt{x^2+1})$
- ◯ **D.** $\frac{1}{2}\ln\frac{1+x}{1-x}$

Question 7 $\int \frac{dx}{\sqrt{x^2+4}} =$

- ◯ **A.** $\operatorname{arsinh}\frac{x}{2}$
- ◯ **B.** $\operatorname{arcosh}\frac{x}{2}$
- ◯ **C.** $\arcsin\frac{x}{2}$
- ◯ **D.** $\frac{1}{2}\arctan\frac{x}{2}$

Question 8 The range of $\tanh x$ is:

- ◯ **A.** all reals
- ◯ **B.** $(-1,1)$
- ◯ **C.** $[1,\infty)$
- ◯ **D.** $(0,\infty)$

Question 9 $\sinh 2x =$

- ◯ **A.** $2\sinh x$
- ◯ **B.** $2\sinh x\cosh x$
- ◯ **C.** $\sinh^2 x$
- ◯ **D.** $\cosh^2 x - \sinh^2 x$

Question 10 For $\cosh x = \frac{5}{4}$, $x =$

- ◯ **A.** $\pm\ln 2$
- ◯ **B.** $\ln\frac{5}{4}$
- ◯ **C.** $\ln 3$
- ◯ **D.** $\ln\frac{1}{2}$ only

Answer grid - Hyperbolic functions

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Question	Answer	Explanation
1	**B**	$\frac{1+1}{2} = 1$.
2	**B**	$\frac{1-1}{2} = 0$.
3	**C**	Fundamental identity.
4	**B**	No minus sign.
5	**A**	$1 - \tanh^2 x = \operatorname{sech}^2 x$.
6	**B**	Standard result.
7	**A**	Plus sign under the root gives arsinh.
8	**B**	Horizontal asymptotes ± 1.
9	**B**	Double angle formula.
10	**A**	$\cosh(\ln 2) = \frac{5}{4}$ and cosh is even.