

CLASS QUIZ: JANUARY 10: HYPERBOLIC FUNCTIONS

MATH 153, SECTION 55 (VIPUL NAIK)

Your name (print clearly in capital letters): _____

- (1) What is the limit $\lim_{x \rightarrow \infty} (\cosh x)/e^x$?

(A) 0
(B) $1/2$
(C) 1
(D) 2
(E) The limit does not exist.

Your answer: _____

- (2) What is the limit $\lim_{x \rightarrow -\infty} (\cosh x)/e^x$?

(A) 0
(B) $1/2$
(C) 1
(D) 2
(E) The limit does not exist.

Your answer: _____

- (3) Consider the function $y = f(x)$ where $f(x) := \arctan(\sinh x)$. Which of the following does $\cosh x$ necessarily equal?

(A) $\sin y$
(B) $\cos y$
(C) $\cot y$
(D) $\sec y$
(E) $\csc y$

Your answer: _____

- (4) Consider the function $y = f(x)$ where $f(x) := \arctan(\sinh x)$ (same as in the previous question). The function is a one-to-one increasing function on its domain. What are its domain and range?

(A) The domain and range are both equal to \mathbb{R}
(B) The domain and range are both equal to the open interval $(-\pi/2, \pi/2)$
(C) The domain equals \mathbb{R} and the range equals the open interval $(-\pi/2, \pi/2)$
(D) The domain equals the open interval $(-\pi/2, \pi/2)$ and the range equals \mathbb{R}
(E) The domain equals the open interval $(-\pi/2, \pi/2)$ and the range equals the closed interval $[-\pi/2, \pi/2]$

Your answer: _____

(5) \sinh is a one-to-one function with domain and range both equal to \mathbb{R} . Hence, it must have an inverse function with domain and range both equal to \mathbb{R} . What is this inverse function?

(A) $x \mapsto (\ln(x) - \ln(-x))/2$

(B) $x \mapsto (1/2) \ln(x^2 + 1)$

(C) $x \mapsto \ln[x + \sqrt{x^2 + 1}]$

(D) $x \mapsto \ln[x - \sqrt{x^2 + 1}]$

(E) $x \mapsto \ln[\sqrt{x^2 + 1} - x]$

Your answer: _____