CLASS QUIZ: JANUARY 11: HYPERBOLIC FUNCTIONS

MATH 153, SECTION 55 (VIPUL NAIK)

Your name (print clearly in capital letters): _____

(1) What is the limit $\lim_{x\to\infty}(\cosh x)/e^x$? *Last year: 21/28 correct*
   (A) 0
   (B) 1/2
   (C) 1
   (D) 2
   (E) The limit does not exist.

   Your answer: _____

(2) What is the limit $\lim_{x\to-\infty}(\cosh x)/e^x$? *Last year: 24/28 correct*
   (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? *Last year: 19/28 correct*
   (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? *Last year: 24/28 correct*
   (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? *Last year: 15/28 correct*

(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: _____