Name: ________________________________
Uni: ___________________________

Solve 3 of the following 4 exercises, at your choice.

This exam consists of 4 exercises. Every exercise is worth 20 points, if solved perfectly. Anyway, the maximum score obtainable at the exam is capped at 60 points. It is better to carefully solve only 3 exercises, than to rush trying to do everything.

Giving the correct answers is not enough. In your solutions, you need to show the procedure you followed to find the answer. To get full credit for an exercise, the procedure must also be correct, not only the answer.

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Exercise 1. Consider the function

\[ f(x) = \sqrt{x^2 + 1} + x. \]

Find the domain and the range, verify that the function is 1-1 and find the inverse.
Exercise 2. Consider the function

\[ f(x) = \frac{1}{1 - e^x}. \]

Find the domain and the range, verify that the function is 1-1 and find the inverse.
Exercise 3. Consider the function

\[ f(x) = \frac{(\cos x)^2 + 1}{(\cos x)^2 - 1}. \]

Find the domain and the range, and verify that the function is not 1-1.
Exercise 4. Consider the function

\[ f(x) = \frac{x^2 + x - 6}{x^2 - 5x + 4}. \]

Find

\[ \lim_{x \to 1^-} f(x) \]

and

\[ \lim_{x \to 2^+} f(x). \]