

Name:

Math 115 Exam 1

January 24, 2019

1. WRITE YOUR NAME ON THIS TEST!
2. Except where indicated, merely finding the answer to a problem is not enough to receive full credit; you must show how you arrived at that answer.
3. Unless indicated, DO NOT convert irrational numbers such as $\sqrt{3}$ or π into decimal approximations; just leave them as they are.
4. If you have a question, raise your hand or come up and ask me.

1) (8 points) Draw an example of a function f such that all of the following hold:

- (i) $\lim_{x \rightarrow -1} f(x)$ exists but is not equal to $f(-1)$,
- (ii) $\lim_{x \rightarrow 0^+} f(x)$ and $\lim_{x \rightarrow 0^-} f(x)$ both exist but are not equal, and
- (iii) $\lim_{x \rightarrow 1^-} f(x)$ exists but $\lim_{x \rightarrow 1^+} f(x)$ does not exist.

2) (15 points) Find all vertical and horizontal asymptotes for the function

$$f(x) = \frac{-7x^2 + 7x + 140}{3x^2 - 39x - 204}.$$

3) Consider the function

$$f(x) = \begin{cases} c^2x - x^5, & x < 2 \\ 18, & x = 2 \\ c^2 + cx + 3, & x > 2 \end{cases}$$

a) (12 points) Find all values of c (if any exist) such that f has a limit at $x = 2$.

b) (8 points) Find all values of c (if any exist) that make f continuous at $x = 2$.

4) Evaluate the following limits:

a) (5 points) $\lim_{x \rightarrow -1} \frac{2x^3 - 1}{x^2 + 1}$

b) (12 points) $\lim_{x \rightarrow \infty} (\sqrt{25x^2 - 16x + 21} - \sqrt{25x^2 + 43x - 98})$

BONUS: (10 points) Compute $\lim_{x \rightarrow 1} \frac{\sqrt[5]{x} - 1}{\sqrt{x} - 1}$.