

MAA 4102, MAA 5104
Homework 11
Due: Friday, April 7, 2017

Solve all problems and be sure to show all work. Answers with no supporting work will be given no credit.

1. Use the definition of limit to prove

$$\lim_{x \rightarrow 2^-} \frac{x^2 + 2x}{x - 2} = -\infty.$$

2. (p.139 3.3.8) Verify that $f(x) = \frac{x-1}{x^2-1}$ has only one vertical asymptote. Prove that $g(x) = \frac{1}{f(x)}$ has no vertical asymptotes.
3. (p.140 3.3.9) Use limits, asymptotes, and roots to graph

$$f(x) = \begin{cases} \frac{e^{1/x}}{e^{1/x}+1} & \text{if } x \neq 0 \\ \frac{1}{2} & \text{if } x = 0. \end{cases}$$

4. Let $D_f = [0, 1] \setminus \{1/n \mid n \in \mathbb{N}\}$ and $f : D_f \rightarrow \mathbb{R}$ be a function given by $f(x) = x^2 + 1$. Determine if the following limits exist and, if so, find their values.
 - (a) $\lim_{x \rightarrow 1} f(x)$
 - (b) $\lim_{x \rightarrow 0^+} f(x)$