

Math 1a Fall 2004 Midterm I Review

1. Determine the vertical and horizontal asymptotes for the function

$$f(x) = \frac{2x}{\sqrt{x^4 - 4}}.$$

For each vertical asymptote, also determine the left-hand and right-hand limits at that asymptote. (For example, if $x = 4$ is a vertical asymptote for f , find $\lim_{x \rightarrow 4^-} f(x)$ and $\lim_{x \rightarrow 4^+} f(x)$.)

2. Suppose that a function f is continuous on the closed interval $[0, 1]$ and that $0 \leq f(x) \leq 1$ for every x in $[0, 1]$. Show that there must be a number c in $[0, 1]$ such that $f(c) = c$.

3. Determine whether the function

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

is differentiable at $x = 0$. If it is, find $f'(0)$.

4. The graphs of four functions are given in the left-hand column below. The graphs of their derivatives are given in the right-hand column. Match each function with its derivative.

