

1. Let

$$f(x) = \begin{cases} 1 & x \text{ is rational} \\ 0 & x \text{ is irrational} \end{cases}$$

For which a does $\lim_{x \rightarrow a}$ exist?

2. Compute each of the following limits:

$$(a) \lim_{x \rightarrow -2} \frac{\frac{1}{x} + \frac{1}{2}}{x^3 + 8} \quad (b) \lim_{x \rightarrow 4} \frac{3 - \sqrt{x+5}}{x-4} \quad (c) \lim_{x \rightarrow 2} \frac{3x^2 - x - 10}{x^2 - 4}$$

3. Let $g(t) = t^2 \ln(t^2)$.

- (a) What is the domain of g ?
 - (b) Sketch a graph of g .
 - (c) Using your graph, demonstrate that $-|t| \leq t^2 \ln(t^2) \leq |t|$ for t in $[-1, 1]$.
 - (d) Evaluate $\lim_{t \rightarrow 0} g(t)$.
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4.

- (a) Compute $\lim_{x \rightarrow 1} 9x^2 + 3x + 7$.
- (b) Compute $\lim_{t \rightarrow 3} t^2 + t + 7$. Say something intelligent about your answers to (a) and (b).
- (c) Compute $\lim_{x \rightarrow 0} \frac{\sin(x)}{x}$. You may reference your textbook if you like.
- (d) Carefully contemplate your answers to (a)-(c), then compute $\lim_{x \rightarrow 0} \frac{\sin(4x)}{3x}$.