

Problem 9.1 Calculate

$$\lim_{x \rightarrow 0} \frac{\tan 2x}{5x}$$

Problem 9.2 Find a number δ so that

$$0 < |x - 6| < \delta \implies \left| \sqrt{16 - 2x} - 2 \right| < \epsilon.$$

Problem 9.3 To what limit does the above $\delta - \epsilon$ argument correspond? Fill in the blanks:

$$\boxed{} \lim_{\boxed{}} \boxed{} = \boxed{}$$

Problem 9.4 If possible, sketch the graph of a function so that

- $f(0) = 0$, and
- $\lim_{x \rightarrow 0} f(x)$ is undefined.

If this cannot be done, write the word “Impossible.”

Problem 9.5 If possible, sketch the graph of a function so that

- $\lim_{x \rightarrow 2^+} f(x) = 3$,
- $\lim_{x \rightarrow 2^-} f(x) = 3$,
- $f(x)$ is discontinuous at $x = 2$.

If this cannot be done, write the word “Impossible.”

Problem 9.6 True or false, and explain: if $\lim_{x \rightarrow 2} g(x) = 6$, then $\lim_{x \rightarrow 2^+} g(x) = 6$ and $\lim_{x \rightarrow 2^-} g(x) = 6$.

Problem 9.7 True or false, and explain: $h(x) = \frac{x^2 - 1}{x - 1}$ is continuous at $x = 1$.

Problem 9.8 Calculate

$$\lim_{x \rightarrow -\infty} \frac{x^2 - 5x + 4}{2x^2 + x - 10}$$

Problem 9.9 Calculate

$$\lim_{x \rightarrow 4^-} \frac{\sqrt{x} - 2}{x - 4}$$

Problem 9.10 Calculate

$$\lim_{x \rightarrow 2^-} \frac{x - 3}{x^2 + 4x + 4}$$

Problem 9.11 Fill in the blank to make this sentence true, if possible: The function

$$f(x) = \begin{cases} \frac{x^2 - x}{x^2 - 7x + 6}, & x \neq 1, \\ \underline{\hspace{2cm}}, & x = 1 \end{cases}$$

is continuous at $x = 1$. If not possible, write the word “Impossible.”

Problem 9.12 Calculate

$$\lim_{x \rightarrow 4^-} \frac{x^2 - 6x + 8}{x^2 - 3x - 4}$$

Problem 9.13 Fill in the blank to make this sentence true: The function

$$f(x) = \begin{cases} \frac{\sin 3x}{2x}, & x \neq 0, \\ \underline{\hspace{2cm}}, & x = 0 \end{cases}$$

is continuous at $x = 0$.