

**Problem 1.** Evaluate the following limits if they exist. If the limit does not exist, explain why.

1.  $\lim_{x \rightarrow 1} f(x)$  where  $f(x) = \begin{cases} \sqrt{1-x} & x < 1 \\ 2 & x \geq 1 \end{cases}$ .
2.  $\lim_{x \rightarrow 2} \frac{x}{x-2}$ . Is  $x = 2$  a vertical asymptote to the function  $f(x) = \frac{x}{x-2}$ ?
3.  $\lim_{t \rightarrow 0} \frac{1+t-3t^2}{9t}$ .
4.  $\lim_{x \rightarrow 0} \frac{x-x^2}{2x^3}$ .

**Problem 2.** Evaluate the following limits if they exist. If the limit does not exist, explain why.

1.  $\lim_{x \rightarrow 2} \frac{x^2 - 6}{x + 2}$ .
2.  $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{x - 3}$ .
3.  $\lim_{x \rightarrow 1/2} \frac{4x^2 - 4x + 1}{2x - 1}$ .
4.  $\lim_{x \rightarrow 2^-} \sqrt{4 - 2x}$ .
5.  $\lim_{x \rightarrow 0} \left( \frac{\sqrt{x^2 + 4} - 2}{x^2} \right)$ .
6.  $\lim_{u \rightarrow 2} \frac{\sqrt{4u + 1} - 3}{u - 2}$ .
7.  $\lim_{h \rightarrow 0} \frac{(x+h)^{-1} - x^{-1}}{h}$ .

**Problem 3.** Evaluate the following limits if they exist. If the limit does not exist, explain why.

1.  $\lim_{x \rightarrow 3} (2x + |x - 3|)$ .
2.  $\lim_{x \rightarrow -6} \frac{2x + 12}{|x + 6|}$ .
3.  $\lim_{x \rightarrow 0} \left( \frac{1}{x} - \frac{1}{|x|} \right)$ .
4.  $\lim_{x \rightarrow 0} \sqrt{x^3 + x^2} \cos \frac{\pi}{x}$ .