

1. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{x \rightarrow -2} \frac{4x + 8}{x^2 + 2x}$
2. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{x \rightarrow 2^+} \frac{x}{4 - x^2}$
3. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{x \rightarrow -\infty} \frac{x^2}{x + 5}$
4. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{h \rightarrow 0} \frac{\sqrt{9 - h} - 3}{h}$
5. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{x \rightarrow \infty} \frac{|1 - x|}{2x}$
6. Find the limit (either a number,  $\infty$ , or  $-\infty$ ) or explain why it does not exist:  $\lim_{x \rightarrow \infty} \frac{x^3 - x}{1 - 3x^3}$
7. Find all the vertical asymptotes of the function  $f(x) = \frac{3x + 6}{(2x - 1)(x + 2)}$
8. If  $\frac{1}{x^2 - 1} \leq f(x) \leq -\cos x$  for all  $x$  in the interval  $(-1, 1)$ , what is  $\lim_{x \rightarrow 0} f(x)$ ?
9. Is the function  $f(x) = \begin{cases} \frac{\sin x}{x} & \text{if } x \neq 0 \\ 1 & \text{if } x = 0 \end{cases}$  continuous at  $x = 0$ ? Explain why or why not.
10. Find the values of  $c$  that make the function  $f$  continuous:  $f(x) = \begin{cases} cx + 1 & \text{if } x \leq 1 \\ (x + c)^2 & \text{if } x > 1 \end{cases}$
11. Use the intermediate value theorem to show that the equation  $\cos x = x^2$  has a solution in the interval  $(0, \frac{\pi}{2})$ .
12. Use the  $\epsilon$ - $\delta$  definition of the limit to prove that  $\lim_{x \rightarrow -1} 3x + 5 = 2$ .
13. Let  $f(x) = \cos x$  and  $g(x) = \begin{cases} x - \frac{\pi}{2} & \text{if } x < 0 \\ x + \frac{\pi}{2} & \text{if } x \geq 0 \end{cases}$ . Is the composite function  $f \circ g$  continuous at  $x = 0$ ? Explain why or why not.