1. Sketch a function $f(x)$ that has the following properties:

(a) $f(3) = 2$
(b) $\lim_{x \to 3^+} f(x) = 3$
(c) $\lim_{x \to 3^-} f(x) = 1$
(d) Is $f(x)$ continuous at $x = 3$? Why or why not? For example if you think the $f(x)$ is continuous at $x = 3$ your answer should start out "I think $f(x)$ is continuous at $x = 3$ because..."

(e) What would we have to change about $f(x)$ to be the opposite of your answer to part (d)? Again, your answer should be precise, "Make sure it satisfies the definition" is very vague and tells me you are not thinking.
2. Let \( g(x) = \begin{cases} 
    x^2 + 2x + 1 & \text{for } x < 2 \\
    x - 1 & \text{for } 2 \leq x
\end{cases} 
\).

(a) Evaluate \( \lim_{x \to 2^-} g(x) \).

(b) Evaluate \( \lim_{x \to 2^+} g(x) \).

(c) Evaluate \( \lim_{x \to 3^-} g(x) \).

(d) Evaluate \( \lim_{x \to 3^+} g(x) \).

3. (a) Come up with a function \( h(x) \) such that \( \lim_{x \to 1^+} h(x) = \infty \) and \( \lim_{x \to 1^-} h(x) = -\infty \). What is \( \lim_{x \to 1^-} h(x) \)?

(b) How can we change \( h(x) \) so that \( \lim_{x \to 1^+} h(x) = \infty \) and \( \lim_{x \to 1^-} h(x) = \infty \)?
4. Create a continuous function $f(x)$ such that $\lim_{x \to \infty} f(x) = 3$ and $\lim_{x \to -\infty} f(x) = 2$. You cannot use constant functions.

5. Evaluate $\lim_{x \to \frac{\pi}{2}} \frac{x - \frac{\pi}{2}}{\cos(x)}$.

6. Which one of these problems was the most difficult for you to solve? What made it difficult? How did you overcome this difficulty?