(10 pts) 1. Sketch the graph of the following function and use it to determine the values of \( a \) for which \( \lim_{x \to a} f(x) \) exists.

\[
f(x) = \begin{cases} 
  x^2 + 1, & \text{if } x < -1 \\
  2x, & \text{if } -1 \leq x < 2 \\
  -x + 4, & \text{if } x \geq 2 
\end{cases}
\]
2. Evaluate the following limits (if the limit does not exist, explain why).

(a) \( \lim_{{x \to 1}} \left( x^2 + \frac{3}{x + 2} \right) \)

(b) \( \lim_{{x \to 3}} \frac{2x^2 - 5x - 3}{x - 3} \)

(c) \( \lim_{{h \to 0}} \frac{(3 + h)^2 - 9}{h} \)

(d) \( \lim_{{x \to 6}} \frac{x^2 - 36}{\sqrt{x} - \sqrt{6}} \)

(e) \( \lim_{{x \to 3}} \frac{|x - 3|}{x - 3} \)

(f) \( \lim_{{y \to \infty}} \frac{2 - 3y^2}{5y^2 + 4y} \)
(10 pts) 3. By calculating an appropriate limit, find the slope of the tangent line to the graph of the function $f(x) = x^2$ at $(3, 9)$.

(10 pts) 4. Explain why the function is discontinuous at 1 and sketch the graph.

$$f(x) = \begin{cases} x^2, & \text{if } x \leq 1 \\ 2x, & \text{if } x > 1 \end{cases}$$
(10 pts) 5.

(a) From the graph of $f$, state the numbers at which $f$ is discontinuous and explain why.

(b) From the graph of $f$, state the open intervals on which $f$ is continuous.
6. The graph shows the position function of a car. Use the shape of the graph to explain your answers to the following questions.

(a) Was the car going faster at A or B?

(b) At which point(s) was the car slowing down?

(c) At which point(s) was the car speeding up?

(d) What happened around point C?
(10 pts) 7. Find the constant $c$ that makes $g$ continuous on $(-\infty, \infty)$.

$$g(x) = \begin{cases} 
  cx + 3c, & \text{if } x < 2 \\
  5x, & \text{if } x \geq 2 
\end{cases}$$

(10 pts) 8. Let $f(x) = x^2 + 5$. Explain why there is a number $c$ such that $f(c) = 12$. 