Problem 1: Consider the function \( f(x) = \frac{x-1}{x^2 + x - 2} \).

(1) If it exists, find the limit. If it does not exist, show why. Use the symbols \( \infty \) or \(-\infty\) as appropriate.

(a) \( \lim_{x \to 1} f(x) \)

(b) \( \lim_{x \to 2} f(x) \)

(c) \( \lim_{x \to \infty} f(x) \)

(2) Find all points of discontinuity of \( f(x) \) and state the type of each one.

Problem 2:

(1) Use the definition of the derivative to find \( f'(0) \) where \( f(x) = \sqrt{1-x} \).

(2) Find all values of \( C \) which will make the following function continuous.

\[
f(x) = \begin{cases} 
2C - 2x & \text{if } x \leq 2, \\
x^2 + C & \text{if } x > 2.
\end{cases}
\]

(3) Find the slope of the line tangent to the graph of \( f(x) = \frac{1-2x^2}{\sqrt{x}} + 3\pi^2 \) at \( x = 4 \). (Do not use the limit)
Problem 1: Consider the function \( f(x) = \frac{x^2 + 2x}{x^2 - x - 6} \).

(1) If it exists, find the limit. If it does not exist, show why. Use the symbols \( \infty \) or \( -\infty \) as appropriate.
   
   (d) \( \lim_{x \to 0} f(x) \)
   
   (e) \( \lim_{x \to 2} f(x) \)
   
   (f) \( \lim_{x \to \infty} f(x) \)

(2) Find all points of discontinuity of \( f(x) \) and state the type of each one.

Problem 2:

(1) Use the definition of the derivative to find \( f'(3) \) where \( f(x) = \frac{1}{x-1} \).

(2) Find all values of \( C \) which will make the following function continuous.

\[
f(x) = 
\begin{cases} 
  2x - C + 1 & \text{if } x \leq 2, \\
  x^2 + 3C & \text{if } x > 2. 
\end{cases}
\]

(3) Find the slope of the line tangent to the graph of \( f(x) = \sqrt{x} \left[ x - 2\sqrt{x} \right] + 2\pi^5 \) at \( x = 4 \). (Do not use the limit)
Problem 1: Consider the function \( f(x) = \frac{2x - x^2}{x^2 + x - 6} \).

(1) If it exists, find the limit. If it does not exist, show why. Use the symbols \( \infty \) or \( -\infty \) as appropriate.

   (g) \( \lim_{x \to 0} f(x) \)

   (h) \( \lim_{x \to 2} f(x) \)

   (i) \( \lim_{x \to \infty} f(x) \)

(2) Find all points of discontinuity of \( f(x) \) and state the type of each one.

Problem 2:

(1) Use the definition of the derivative to find \( f'(3) \) where \( f(x) = 1 - x^2 \).

(2) Find all values of \( C \) which will make the following function continuous.

\[
f(x) = \begin{cases} 
2x^2 - C & \text{if } x \leq 2, \\
x + 3C & \text{if } x > 2.
\end{cases}
\]

(3) Find the slope of the line tangent to the graph of \( f(x) = \frac{x - 2 \sqrt{x}}{\sqrt{x}} + 2e^5 \) at \( x = 4 \). (Do not use the limit)