Problem 2: (20 points) (Justify your answers) Let

\[ f(x) = \begin{cases} 
  x + 1 & , \quad x \leq 1 \\
  \frac{1}{x} & , \quad 1 < x < 4 \\
  \sqrt{4-x} & , \quad x \geq 4
\end{cases} \]

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

(b) Find \( \lim_{x \to 4} f(x) \)

(c) Find all numbers at which \( f \) is discontinuous and state the type of discontinuity of each one.

(d) Find the numbers at which \( f \) is discontinuous but continuous from the left

(e) Find the numbers at which \( f \) is discontinuous but continuous from the right

(f) Show that the function is left–hand differentiable at \( x = 1 \)
**Problem 2:** (7 points) Find all horizontal asymptotes to the function \( f(x) = \sqrt{x^2 + 5} - x \)

**Problem 3:** (7 points) Find the equation of the tangent line to \( y = \sqrt{x - 2} \) that is parallel to the line \( x - 2y = 2 \) (Use the definition of the derivative)

**Problem 4:** (7 points) Consider the graph of the function \( f(x) \). On the same graph, sketch the graph of \( f'(x) \)