Instructions. Please justify your answers to each of the following problems. Answers without any explanation (or work shown) will not receive credit.

1) Compute the following limits:
   (a) \( \lim_{x \to 2} \frac{x^2 - 5x + 6}{x + 2} \)
   (b) \( \lim_{x \to 2} \frac{x^2 - 5x + 6}{x - 2} \)
   (c) \( \lim_{x \to 9} \frac{\sqrt{x + 7} - 4}{x - 9} \)
   (d) \( \lim_{x \to \infty} \sin(x) \)
   (e) \( \lim_{x \to 1} f(x) \) where \( f(x) = \begin{cases} x^2 - 1 & \text{for } x < 1 \\ \log_{10}(x) & \text{for } x \geq 1 \end{cases} \)

2) Consider the following function:
   \( f(x) = \begin{cases} 2^x & \text{for } x < 2 \\ x & \text{for } x = 2 \\ x^2 & \text{for } x > 2 \end{cases} \)
   Compute \( \lim_{x \to 2} f(x) \). Is the function \( f(x) \) continuous at \( x = 2 \)?

3) Evaluate the limit \( \lim_{t \to 0} \left( \frac{1}{t} - \frac{1}{t^2 + t} \right) \).

4) Let \( f(x) = \frac{1}{x} \).
   (a) Use the limit definition of derivative to compute \( f'(x) \).
   (b) Find the slope of the tangent line to the graph of \( f(x) \) at \( x = 2 \).
   (c) Find the equation of the tangent line to the graph of \( f(x) \) at \( x = 2 \).

5) Let \( f(x) = \tan(x) \).
   (a) Find the \( x \)-intercepts of \( f(x) \). Recall that an \( x \)-intercept is the value of \( x \) such that \( f(x) = 0 \).
   (b) Find the vertical asymptotes of \( f(x) \). Justify at least one of them by taking limits.
   (c) Based on the findings of parts (a) and (b), draw a rough sketch of the graph of \( f(x) \).