Problem 1: Explain as best you can why \( f(x) \) has a vertical asymptote at \( x = 3 \), but \( g(x) \) does not. If you don’t mention limits then your answer is incomplete.

\[
 f(x) = \frac{x^2 - 7x + 4}{4x^2 - 4x - 24} \quad g(x) = \frac{-2x^2 + 12x - 18}{4x^2 - 8x - 12}
\]

Problem 2: We’re going to investigate the function \( g(t) = \frac{|t - 2|}{t + 1} \), where \( g \) measures gallons and \( t \) is in minutes. Calculate each of the following.

(a) \( \lim_{t \to \infty} g(t) \)
(b) \( g'(1) \), include units.
(c) \( g'(2) \), include units.
(d) Plot this function (with a graphing utility) and sketch a graph of the slope of the tangent line as \( t \) varies from 0 to 4. Try to give an equation for the graph you sketch.
(e) Describe a scenario this function could be modeling (taking into account the specified units).

Problem 3: Provide as many different examples as you can of functions that do not have a derivative at \( x = 3 \). Verbally explain your answers (pretend you’re talking to a roommate or younger sibling).