Math 1A Quiz 5

Instructions: Please simplify your answers as much as possible, and box or circle your final answer. Remember, answers without justification will not receive full credit. You have 20 minutes. Good luck!

1. Find \( \lim_{x \to -\infty} \sqrt{4x^2 + 5x + 2x} \).

\[
\lim_{x \to -\infty} \sqrt{4x^2 + 5x + 2x} = \lim_{x \to -\infty} \sqrt{4x^2 + 5x - 2x} = \lim_{x \to -\infty} \sqrt{4x^2 - 2x} = \lim_{x \to -\infty} \frac{4x^2 - 2x}{x} = \lim_{x \to -\infty} \frac{4x^2}{x^2} = \lim_{x \to -\infty} \frac{4x}{x} = \lim_{x \to -\infty} 4 = 4
\]

2. \( f(x) = \frac{1}{x^2} \). Find \( f'(x) \) using the definition of the derivative and state its domain. Answers using the derivative rules will receive no credit.

\[
f'(x) = \lim_{h \to 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} = \lim_{h \to 0} \frac{x^2 - (x+h)^2}{x^2(x+h)^2} \cdot \frac{h}{h} = \lim_{h \to 0} \frac{x^2 - x^2 - 2xh - h^2}{x^2(x+h)^2} = \lim_{h \to 0} \frac{-2x}{x^2} = -\frac{2x}{x^3}
\]

Domain: All except \( x = 0 \), \((-\infty, 0) \cup (0, \infty)\).

3. Draw a function \( g \) that satisfies the following properties:
\( g \) is continuous everywhere
\( g \) is not differentiable at 0 or 1
\( \lim_{x \to 0^-} g'(x) = \infty \)