**Instructions:** The purpose of this assignment is to develop your ability to formulate and communicate mathematical arguments.

Please write a short essay in response to each of the following questions, following the standard rules for grammar and editing. You should provide well-written, complete answers to each of the questions. It is strongly recommended that you use word processing software (such as Microsoft Word or Libre Office) for this assignment, with hand-drawn graphs and pictures.

When using mathematical symbols in your essay, either use them as part of complete sentences or display them separately from your paragraphs. Your textbook is a good model for this type of writing.

Your complete assignment should:
- have your name and section number on each page,
- be stapled, and
- be neat and legible.

*Unreadable work will receive no credit.*

**Question A:** Let \( f(x) = x(2 + \sin x) \) and \( g(x) = x^2 + 1 \).

1. Show directly (i.e. without L'Hôpital’s Rule) that \( \lim_{x \to \infty} \frac{f(x)}{g(x)} = 0 \).

2. Show that \( \lim_{x \to \infty} f(x) = \lim_{x \to \infty} g(x) = \infty \), but \( \lim_{x \to \infty} \frac{f'(x)}{g'(x)} \) does not exist.

Do (1) and (2) contradict L'Hôpital’s Rule? Explain.

**Question B:** Find a point on the graph of \( y = \sqrt{x - 1} \) closest to the point \((3, 0)\).