

Math 1231 Fall 2023  
Single-Variable Calculus I Section 13  
Mastery Quiz 3  
Due Thursday, September 14

This week's mastery quiz has two topics. Everyone should submit both. (Yes, even if you got a 2/2 on M1 last week; you need to get a major topic right at least twice.)

Feel free to consult your notes, but please don't discuss the actual quiz questions with other students in the course.

Remember that you are trying to demonstrate that you understand the concepts involved. For all these problems, justify your answers and explain how you reached them. Do not just write "yes" or "no" or give a single number.

Please turn this quiz in class on Thursday. You may print this document out and write on it, or you may submit your work on separate paper; in either case make sure your name and recitation section are clearly on it. If you absolutely cannot turn it in in person, you can submit it electronically but this should be a last resort.

**Topics on This Quiz**

- Major Topic 1: Computing Limits
- Secondary Topic 2: Definition of Derivative

**Name:**

**Recitation Section:**

**Major Topic 1: Computing Limits**

(a) 
$$\lim_{x \rightarrow 1} \frac{\sin(3x - 3) \sin(x - 1)}{(x - 1)^2} =$$

(b) 
$$\lim_{x \rightarrow -1} \frac{1 - x}{1 + x} =$$

(c) 
$$\lim_{x \rightarrow +\infty} \frac{3x^2 + 2x + 1}{\sqrt{x^4 - x^2 + x}} =$$

**Secondary Topic 2: Definition of Derivative**(a) If  $f(x) = x^2 + 2x$ , find  $f'(2)$ , explicitly using the definition of the derivative.(b) If  $g(x) = \frac{1}{x+2}$ , find  $g'(a)$ , explicitly using the definition of the derivative.