Math 1231 Summer 2024
Mastery Quiz 6
Due Monday, July 22

This week's mastery quiz has two topics. Everyone should submit M3 but if you already have a 2/2 on S4 (check Blackboard—grades may have changed after the midterm) you don't need to submit those topics again.

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 in this quiz in class on Monday. 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 is 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 3: Extrema and optimization
- Secondary Topic 4: Related rates

Name:

Name:

Major Topic 3: Extrema and optimization

(a) The function $g(x) = 3x^4 - 2x^3 - 3x^2 + 5$ has absolute extrema either on the interval $(-1, 2)$, or on the interval $[-1, 2]$. Pick one of those intervals, explain why g has absolute extrema on that interval, and find the absolute extrema.

(b) Find and classify the critical points of $f(x) = \sqrt[3]{x^3 - 3x}$, i.e. for each critical point you find, say whether it is a relative minimum, a relative maximum, or neither.

Secondary Topic 4: Related rates

A balloon is rising at a constant speed of 5 feet per second. A cyclist is moving along a straight road at a speed of 15 feet per second. When she passes under the balloon, it is 45 feet above her. How quickly is the distance between the cyclist and the balloon changing 3 seconds after she passes under it?