

MCS 121
Review Sheet for Exam 2

This exam covers sections 3.9, 4.1, 4.3-4.7, and the limit definition of the derivative. There will be no questions whose only purpose is to test your knowledge of earlier material, except your knowledge of basic limit calculations and the definition of the derivative, but you must be familiar with that material since much of this newer material depends upon it.

This sheet is meant to highlight the important topics on the exam. You should not assume that a topic will not be on the exam just because it is not mentioned on this sheet. All of the material in the sections mentioned above is fair game.

Specific Topics and Skills by Section

2.2-2.3 You should be able to state the definition of the derivative.

3.9 You should understand that for a differentiable function f , the tangent line at a point x_0 in the domain of f stays close to the graph of f for values of x near x_0 , and therefore the tangent line approximates the graph of f near x_0 . You should be able to use a linear approximation of a function to estimate values of the function. You should understand and be able to explain how concavity affects whether a tangent line approximation is an under- or an over-estimate.

4.1 You should know the meaning of the terms local maximum, local minimum, critical point, and inflection point. You should know how to find each of these graphically using your calculator and algebraically using derivatives. You should understand the first and second derivative tests for local maxima and minima. You should understand what inflection points are, how to estimate their locations graphically, and how to find them using first and second derivatives. You should understand how inflection points are related to the local maxima and minima of the first derivative. You should be able to give rough sketches of functions knowing only the signs of the functions' first and second derivatives.

4.3 You should be familiar with the term *global maximum* and *global minimum*. You should know that the global maxima and minima of continuous functions defined on a closed interval occur either at critical points or at endpoints. In many cases, you should be able to find the global maxima and minima, if any, of a function defined on an open interval.

4.4 You should understand how ideas from calculus can be applied to economics. You should be familiar with, be able to compute, and be able to explain the following concepts from economics: revenue, cost, profit, marginal revenue, marginal cost, marginal profit and average cost. You should be able to set up and solve maximum profit problems in simple cases.

4.5 You should be able to solve optimization problems. In particular, you should be able to find equations that model real-world situations, and then know how to use calculus or your calculator (depending on the situation and the instructions for the exercise) to find an optimal solution. You should know how to test for maxima and minima.

4.6 You should know how to set up and solve simple related rates problems. In particular, you should be able to write down equation(s) relating the variables involved and to differentiate in order to relate their rates of change.

4.7, 1.8 You should be able to evaluate limits, not only by the methods we studied earlier in section 1.8, but also by L'Hospital's rule.