

You have 20 minutes to take this quiz. Each problem will be graded for clarity of work as well as correctness, so show all work **clearly and in order**. Circle or otherwise indicate your final answers. Please note that there are problems on both the front and the back of this page.

**1.** (10 points) [Similar to #52, 4.3]

Below the *derivative* of a function  $f(x)$  is given. Use your calculator to graph  $f'(x)$  on the indicated interval. Estimate the (interior) critical numbers of  $f(x)$  and determine whether  $f(x)$  has a local maximum, a local minimum, or neither at each of these critical numbers. Round off your answers to three decimal places. ***Make sure you read this question carefully!!***

*NOTE: Even though you are using your calculator, show all your work; sketch any relevant graphs and explain your reasoning or you won't get full credit.*

$$f'(x) = \sin^2 x + 2 \sin(2x), \quad [-2, 2]$$

**2.** (10 points) [Similar to #35, 4.5]

A rectangular box with square base and top is to be made to contain 1250 cubic feet. The material for the base costs 35 cents per square foot, for the top 15 cents per square foot, and for the sides 20 cents per square foot. Find the dimensions that will minimize the cost of the box.

*NOTE: Make sure you show all your work clearly and in order, including: drawing a picture, writing out the “math problem” associated to this word problem, and showing all steps while solving this “math problem.” Be sure that you clearly argue why your answer is in fact the global minimum. Do NOT use your calculator for this problem (except for arithmetic).*

**BONUS:** (2 points)

Can you construct the box so that it costs the *most*? If so, how? If not, why not?