

Week 13 — Exam Review

MATH:113, Recitations 304 and 305

CURVES

Names: _____

Write the expression for the linearization of a function $f(x)$ at $x = a$. What does each term represent?

What does the *extreme value theorem* say? What assumptions do we make?

What does the *mean value theorem* say? What assumptions do we make?

Write the definitions for *critical points* and *inflection points*.

Problem 0. Find the linear approximation for the function $f(x) = x^2 + 3x + 4$ at $a = -3/2$ and $a = 0$.

Problem 1. Consider the function $f(x) = \ln(4 - x^2)$. Find:

- (a) the domain.
- (b) the range (or *image*).
- (c) and simplify $f'(x)$ and $f''(x)$.
- (d) all critical points.
- (e) all inflection points.
- (f) intervals where the function is increasing and decreasing.
- (g) intervals where the function is concave-up or concave-down.

Using the information above, sketch $f(x)$.

This question is directly from your practice exam, save for a small change. Make sure you're comfortable with the concepts, setup, and computation strategies used in this problem.

Problem 2. Find two positive numbers x and y whose sum is 300 and whose product xy is as large as possible.

Problem 3. Because we're cheap, we'd like to construct a box that has no top, a square bottom, and has volume 216 in^3 . What should the width and height of the box be to *minimize its surface area*?