

Optimization Practice

Name: _____

Stewart §14.7–14.8.

Group work _____ Stewart §14.7–14.8

At the board with your group. *I will assign the groups.* Pick a **scribe**, a **verifier**, and a **reporter**, and **rotate at the start of each problem**: the scribe becomes the verifier, the verifier becomes the reporter, the reporter becomes the scribe. Work the problems in order, and **check your answers with me before moving on to the next problem**.

GROUP WORK — AT THE BOARD

PROBLEM 1. Find *all* critical points of

$$f(x, y) = x^4 + y^4 - 4xy$$

and classify each as a local maximum, local minimum, or saddle point.

PROBLEM 2. Find the absolute maximum and absolute minimum values of

$$f(x, y) = x^2 + y^2 - 2y$$

on the half-disk $x^2 + y^2 \leq 4$, $y \geq 0$, and the points where they occur.

PROBLEM 3. Find the point on the plane $3x + 2y + z = 6$ that lies closest to the origin, and the distance from the origin to the plane. Use Lagrange multipliers, minimizing the *square* of the distance. Explain how you know your answer is the minimum.

PROBLEM 4. An open-top rectangular box is to be built to hold 32 cubic feet of Iowa corn. Find the dimensions of the box that use the least material. Explain how you know your answer is the minimum.

PROBLEM 5. Find the maximum and minimum values of

$$f(x, y) = x^3 + y^3$$

on the circle $x^2 + y^2 = 1$, and the points where they occur.

PROBLEM 6. Show that the function

$$f(x, y) = ax^2 + bxy + y^2$$

has a critical point at the origin no matter what the constants a and b are. For which a and b is it a local minimum? For which is it a saddle point? Is there a pair a, b for which your answer is neither?

Exit ticket

Name: _____

Complete this and turn it in at the end of class; it counts toward Engagement. **You may discuss with the people around you.**

Find the absolute maximum and absolute minimum values of

$$f(x, y, z) = x^2 + 2y^2 + 3z^2$$

on the solid ball $x^2 + y^2 + z^2 \leq 1$, and the points where they occur.