Name : _____ **Class Number:** _____

Math 1C: MD Lesson 14 Suggested Problems

Theoretic Problems: Discussed in-class

---

1. **Review the Parallel Gradients Theorem and Lagrange Multiplier Procedure**
   A. What is a constrained optimization problem? What general form do these problems take?
   B. How are constrained optimization problems different than the optimization problems we studied in Lesson 13 of this class?
   C. State, from memory, the Parallel Gradient Theorem.
   D. What is the geometric interpretation of this theorem? In other words, how does this theorem relate the constraint curve $g(x, y) = 0$ to the level curves of the objective function $f(x, y)$.

Problems Solved in Jeff's Handwritten Notes

---

2. Example 12.8.7 p. 946

---

3. Example 12.9.1 p. 953: Find the maximum and minimum values of $f(x, y) = y^2 - 4x^2$ subject to the constraint $x^2 + 2y^2 = 4$

---

4. Example 12.9.2 p. 955: Find the point(s) on the cone $z^2 = x^2 + y^2$ closest to the point $P(3, 4, 0)$.

Suggested Problems

---

5. Chapter 12 Review Exercise 93 p. 962: Find the maximum and minimum values of
$$f(x, y) = 2x + y + 10$$
subject to the constraint $2(x - 1)^2 + 4(y - 1)^2 = 1$.

---

6. Exercise 12.9.13 p. 957: Find the maximum and minimum values of
$$f(x, y) = y^2 - 4x^2$$
subject to the constraint $x^2 + 2y^2 = 4$.

Optional Challenge Problems

---

8. Exercise 12.9.57 p. 958
9. Exercise 12.9.58 p. 958
10. Exercise 12.9.59 p. 958