

# Math 2173 Spring 2021 Recitation Handout 2

Group Member 1: \_\_\_\_\_

Group Member 2: \_\_\_\_\_

Group Member 3: \_\_\_\_\_

Group Member 4: \_\_\_\_\_

Group Member 5: \_\_\_\_\_

Group Member 6: \_\_\_\_\_

Below is a checklist of instructions to follow when completing this assignment. Failure to follow these directions will result in penalty on your final score and/or in some problems not being graded. If multiple directions are not followed, then it is also possible that the assignment will not be accepted for any credit at all. Please contact your TA or make a post on the discussion boards for this course if you have any questions about this assignment or these directions.

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Checklist of Instructions	
	Please clearly write the names of all group members working on this assignment in the spaces allotted above.
	This assignment must be completed by a group of 3, 4, 5, or 6 members.
	This assignment is to be uploaded to gradescope as a pdf file no later than 11:59 PM EST on Sunday, January 24.
	The assignment will be uploaded by 1 group member, and that group member will be responsible for manually entering the names of all other collaborators into gradescope.
	This assignment must be completed using this template. You may either print this template to write on it and then scan it (pages ordered correctly) into a pdf file, or you may write directly on the template using programs such as notability.
	If you need more space than what is given to solve a given problem, then you will find blank pages provided at the end of this template. At the end of each problem section of this assignment you will find a space in which to indicate on what page your work is continued in case you used additional pages to complete your solution. You must provide the page number on which your work is continued in the allotted space, or write 'N/A' in case you did not use any additional pages.
	On the additional pages, you will also find space in which to indicate which problem the page is being used for, and if the page is used then that space must also be filled.
	To complete this handout, you may use your textbook, class notes, discussions with your TA and group members, and any resources that are available on Carmen. You should not receive any help from the MSLC or people outside of your group when solving these problems. You may discuss these problems on the Carmen discussion boards, but you should not provide your entire solution when answering a such question, you should only give a hint or a helpful idea.

**(Ungraded Optional Problem) Example 13.8.8:** Find the point(s) on the plane  $x + 2y + z = 2$  closest to the point  $P(2, 0, 4)$ .

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**Problem 13.8.55 (10 points):** Find the point on the plane  $x + y + z = 4$  nearest the point  $P(0, 3, 6)$ . Remember to justify why your answer is a global minimum and not just a local minimum.

*Note:* You may solve this problem using geometry instead of calculus and still receive full credit as long as you show all of your work.

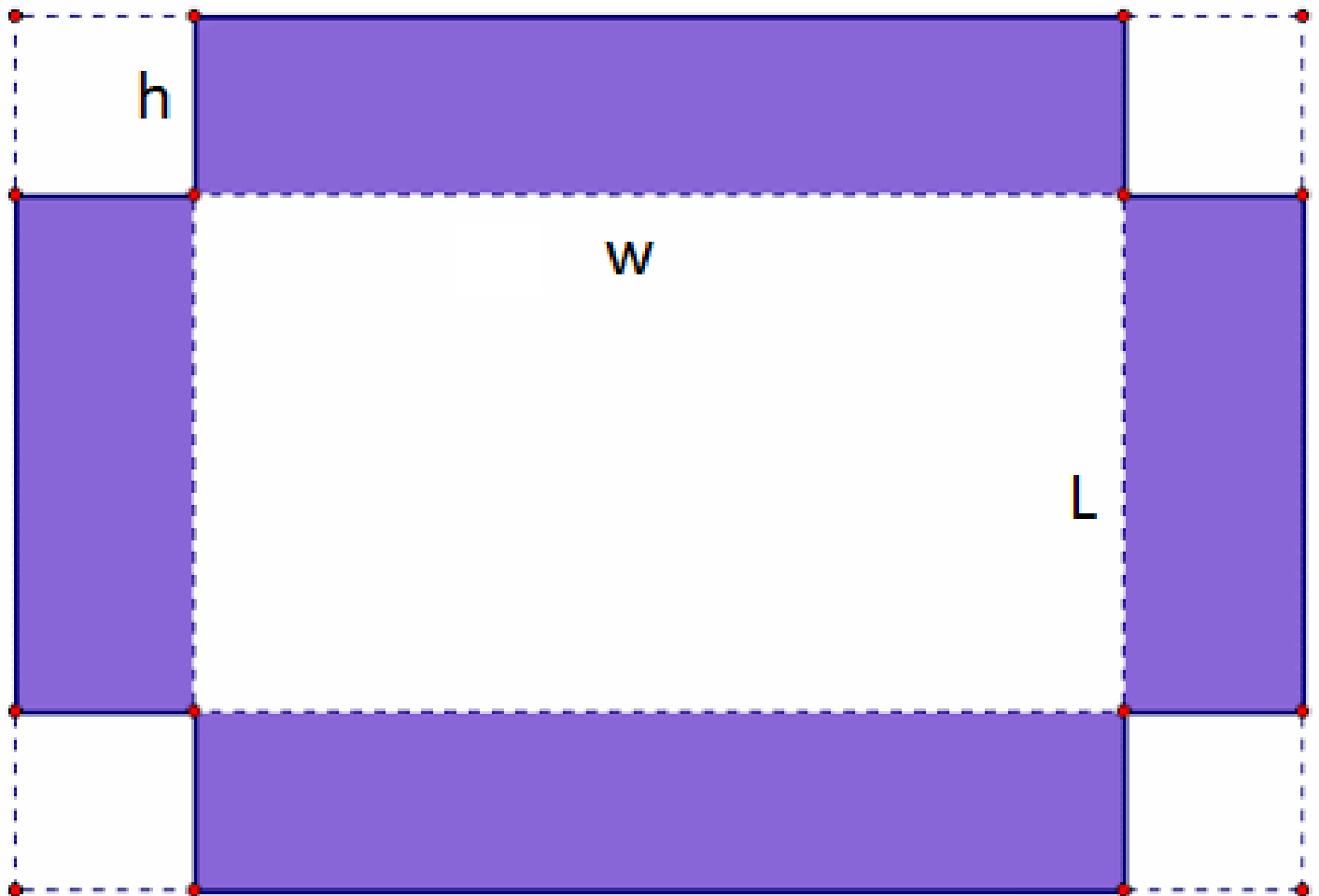
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**Problem 13.8.11 (3 points):** Find all critical points of  $f(x, y) = (3x - 2)^2 + (y - 4)^2$ .

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**Problem 13.8.37 (10 points):** A lidless cardboard box is to be made with a volume of  $4 \text{ m}^3$ . Find the dimensions of the box that require the least cardboard.



Note: It would be nice for you to justify that the local minimum that you find is also a global minimum, but it is not required to receive full credit for this problem.

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**Problem 13.8.41 (7 points):** Show that the second derivative test is inconclusive when applied to the function  $f(x, y) = x^4y^2$  at the point  $(0, 0)$ . Show that  $f(x, y)$  has a local minimum at  $(0, 0)$  by direct analysis.

*Hint:* The product of 2 negative numbers is positive.

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**Problem 13.8.47 (10 points):** Find the absolute minimum and maximum value of the function

$$(1) \quad f(x, y) = 2x^2 - 4x + 3y^2 + 2 = 2(x - 1)^2 + 3y^2$$

over the region

$$(2) \quad R := \{(x, y) \in \mathbb{R}^2 \mid (x - 1)^2 + y^2 \leq 1\}.$$

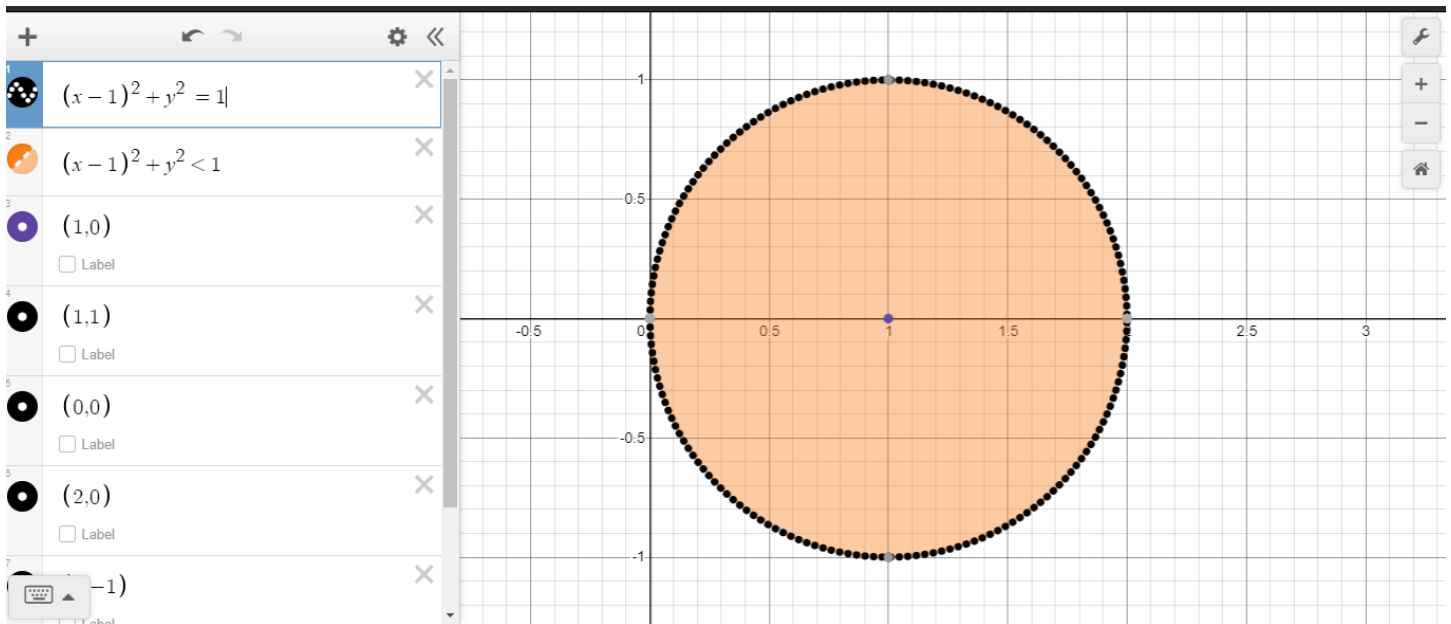


FIGURE 1. A picture of the region  $R$ . The boundary is dotted in black and the interior is shaded in orange.

*Note:* This problem is similar to example 13.8.6.



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