

# Homework 7

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Math 282 Computational Geometry  
due 5:00pm on Tuesday, January 24

Solve the following problems and write your solutions clearly and neatly. Make sure to explain your reasoning and provide mathematical details that support your answers. For a few tips on writing solutions, see [this helpful guide for mathematical writing](#).

These exercises are for everyone, regardless of whether or not you are taking this course for CS elective credit.

You may write or type your solutions electronically, or write them on paper and scan/photograph them. If you photograph your papers, please use a scanning app to produce a single PDF file containing your solutions. Upload your written solutions to the [Homework 7](#) assignment on Moodle.

1. Exercise 4.31
2. Exercise 4.33
3. Let  $R$  and  $B$  be two sets of 2D points, colored red and blue, respectively. We want to determine whether there exists a circle that encloses all the red points and excludes all the blue points. If such a circle exists, we want to find one.  
Use the paraboloid  $z = x^2 + y^2$  to translate this to a problem into a 3D problem that is easier in the sense that involves finding a planes rather than finding a circle. State the 3D problem clearly. Explain a solution to the 3D problem gives a circle that solves the 2D problem.  
Then design an algorithm for solving the 3D problem. A brute-force inefficient algorithm suffices, as long as it really would always work. Describe your algorithm at a high level, giving enough detail so that your algorithm is unambiguous. You don't need to implement it in code (though you can if you want).
4. Let  $P$  be the convex polygon with vertices  $(0, 0), (10, 0), (12, 2), (8, 4), (3, 6), (-3, 3)$ . Use the algorithm described on page 122 to find the medial axis of  $P$ , and draw the stages of the construction.
5. Exercise 5.8 — Either give an example or explain why none exists.
6. Exercise 5.11
7. Exercise 5.12
8. *Creativity*: Give one example of a mathematical idea from this class that you found creative, and explain what you find creative about it. For example, you can choose an instance of creativity you experienced in your own problem-solving, an idea from the textbook, or something you witnessed in another person's reasoning.