

# Homework 9

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Math 282 Computational Geometry  
due 5:00pm on Thursday, April 22

Solve the following problems from the textbook, 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 (and your code/output if relevant) to the [Homework 9](#) assignment on Moodle.

1. **all:** Exercise 5.30
2. **all:** Exercise 5.31
3. **all:** Exercise 5.32
4. **math only:** Exercises 5.43 and 5.44
5. **CS only:** Implement one of the following in your favorite programming language:
  - (a) Implement the algorithm from Section 5.1 for computing the medial axis of a convex polygon  $P$ . Note that The input to your algorithm should be the coordinates of the vertices, in counterclockwise order. The output should be a list of vertices of  $M(P)$ , or even better, a list of edges in  $M(P)$ . Provide your code and also sample input and output that demonstrates that your code works.
  - (b) Implement the midpoint transformation for polygons from Section 5.5. Demonstrate the result of applying a large number of iterations of the transformation on at least three sample polygons of your choosing. Also compute the length (i.e., sum of all the edge lengths) after each iteration of the transformation. By how much does the length decrease with each iteration? Can you see the process converging in some sense?
6. **all:** State at least two possible ideas for your final project. You don't have to commit to either project idea at this time, but find at least two topics that pique your curiosity.