

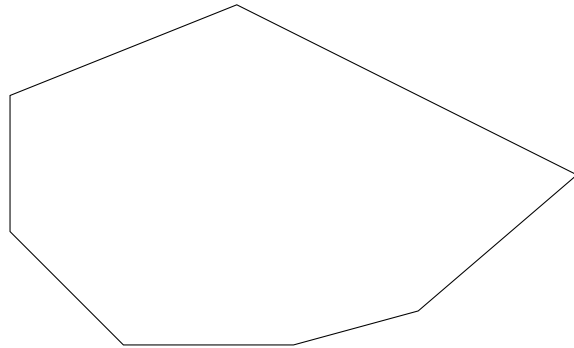
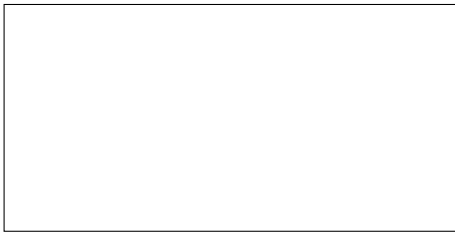
# Medial Axis

Math 282 Computational Geometry

*Definition:* Let  $P$  be a polygon, with boundary  $\partial P$ . The **medial axis**  $M(P)$ , also known as the **cut locus of  $\partial P$** , is the closure of the set of points in  $P$  that have two or more closest points in  $\partial P$ .

## Part 1: Convex Polygons

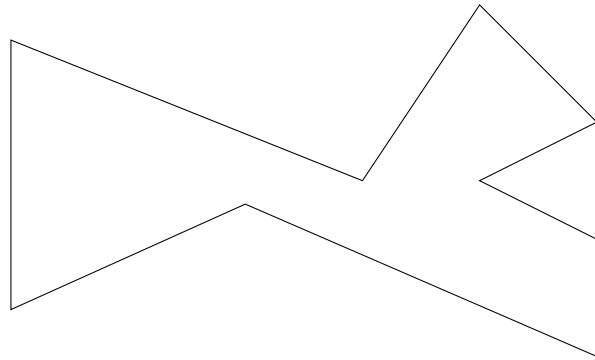
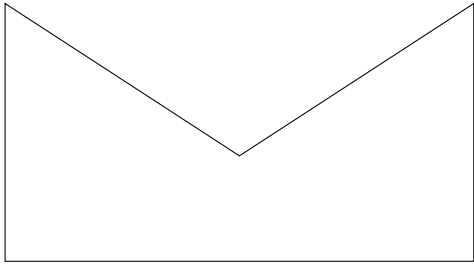
1. Find the medial axis for each of the following polygons.



2. Let  $P$  be a convex polygon of with  $n$  vertices. Is it possible for  $M(P)$  to have a vertex of degree  $n$ ? Either give an example or explain why this is not possible.
3. Let  $P$  be a convex polygon with  $n$  vertices. What is the maximum and minimum number of segments of the medial axis  $M(P)$ ?
4. Design an algorithm that finds the medial axis of a convex polygon. Be as specific as you can about the implementation details. What is the computational complexity of your algorithm?

## Part 2: Nonconvex Polygons

5. Find the medial axis of each of the following polygons.



6. Is there a nonconvex polygon whose medial axis consists entirely of straight segments? Either give an example or explain why this is not possible.

7. What is the minimum number of segments in the medial axis for an arbitrary polygon of  $n$  vertices?