Project: Polygons
Mathematical Programming with Python

MATH 2604: Advanced Scientific Computing 4
Spring 2025
Monday/Wednesday/Friday, 1:00-1:50pm

https://people.sc.fsu.edu/~jburkardt/classes/python_2025/polygon/polygon.pdf

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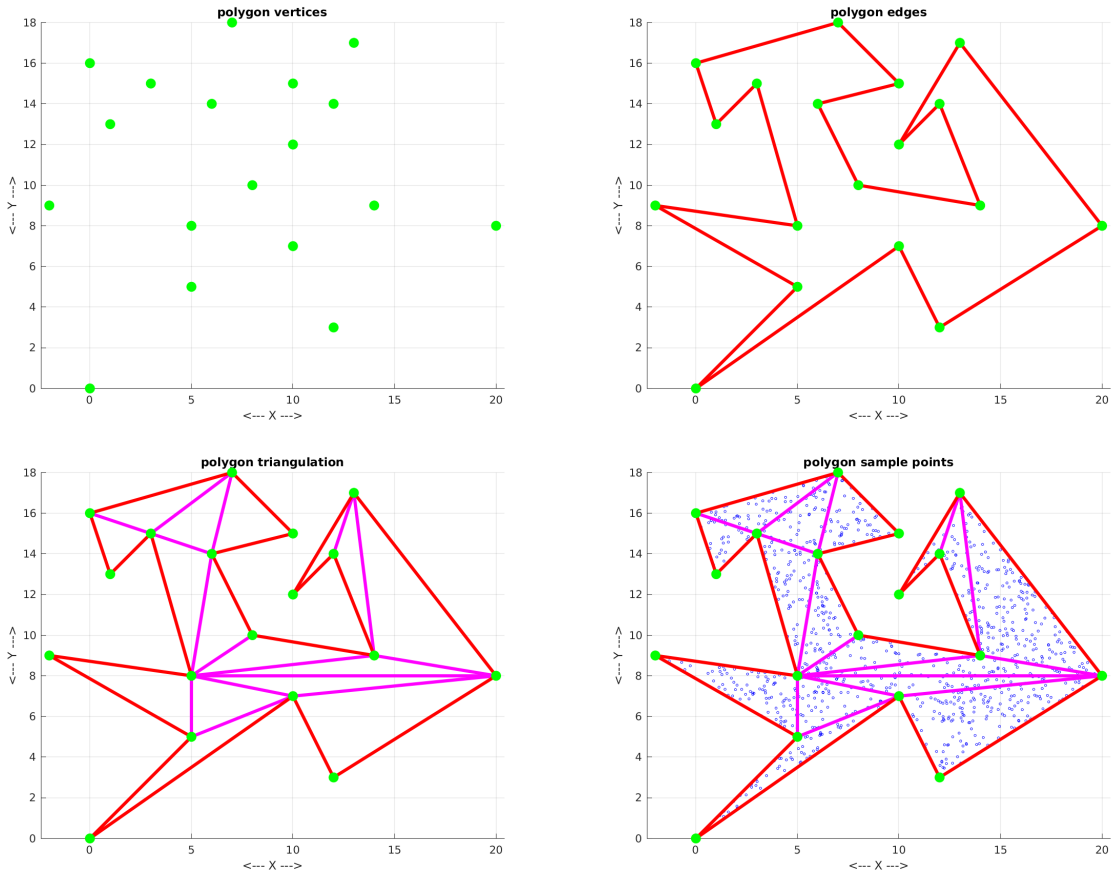

Triangulate and sample a polygon

A polygon is a geometric shape that is easy to define and handle computationally. The most convenient way to deal with a polygon is to regard it as a collection of triangles, since for triangles it is easy to compute areas and other properties, and there are ways of combining that information so it applies to the polygon. However, computing the triangulation of a polygon is a complicated task. In this project, you are asked to make a study of some properties of polygons. If you need to do triangulation, you are permitted to refer to a triangulation program that already exists. I can refer you to one if you need it.

In your project, you should consider some of the following topics, and investigate them by producing Python programs:

1. classification: is a polygon convex? Is it simple (does not cross itself).

2. compute the area, and the centroid;
3. triangulate a convex polygon (not so hard);
4. compute random sample points in a polygon;
5. estimate integrals of $f(x, y)$ over the polygon.
6. given a point p, is it inside the polygon?
7. given a point p, what is the nearest polygon point?
8. what is the largest circle contained in the polygon?
9. do two polygons intersect?