An almost forgotten Gauss' little geometry gem is as follows. Consider a convex pentagon 01234 of area A. To compute A, you don't have to triangulate, dissect or integrate but just go around the pentagon and measure its vertex triangles. Let their areas be (0), (1), (2), (3), (4), and let

$$c_1 = (0) + (1) + (2) + (3) + (4),$$
$$c_2 = (0)(1) + (1)(2) + (2)(3) + (3)(4) + (4)(0).$$

In fact, c_1 and c_2 are the first and second cyclic symmetric functions of (0), (1), (2), (3), (4). The Gauss pentagon formula is:

$$A^2 - c_1 A + c_2 = 0.$$

In particular, if the pentagon has all vertex triangles of area a, then $A = \sqrt{5}\varphi a$, where φ is the golden ratio.

We give several proofs of this beautiful formula, relate it to Monge and Ptolemy formulas, and extend it to hexagons, discuss affine regular polygons etc.