1. Eigenvalues for the domain star

Radius function:

$$R(\theta) = -0.4\,\mathrm{abs}\,(\cos(3\theta)) + 1$$

Adaptive finite element method of degree 2 with 104588 triangles.

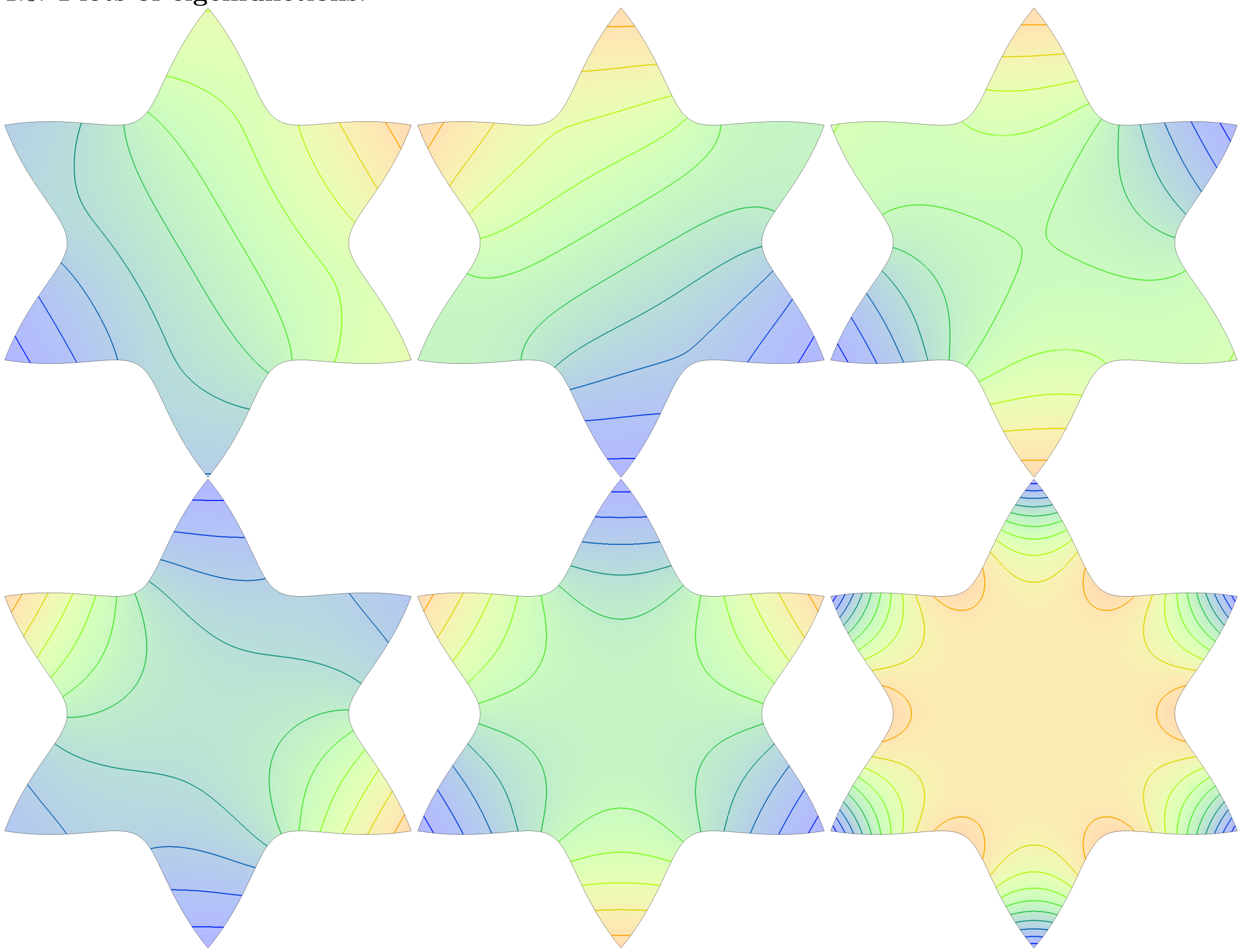
1.1. Geometric quantities (perimeter L and constants g_i). All quantities evaluated using boundary integral for a very fine mesh. For g_i we use geometric representations from Lemma 6.2.

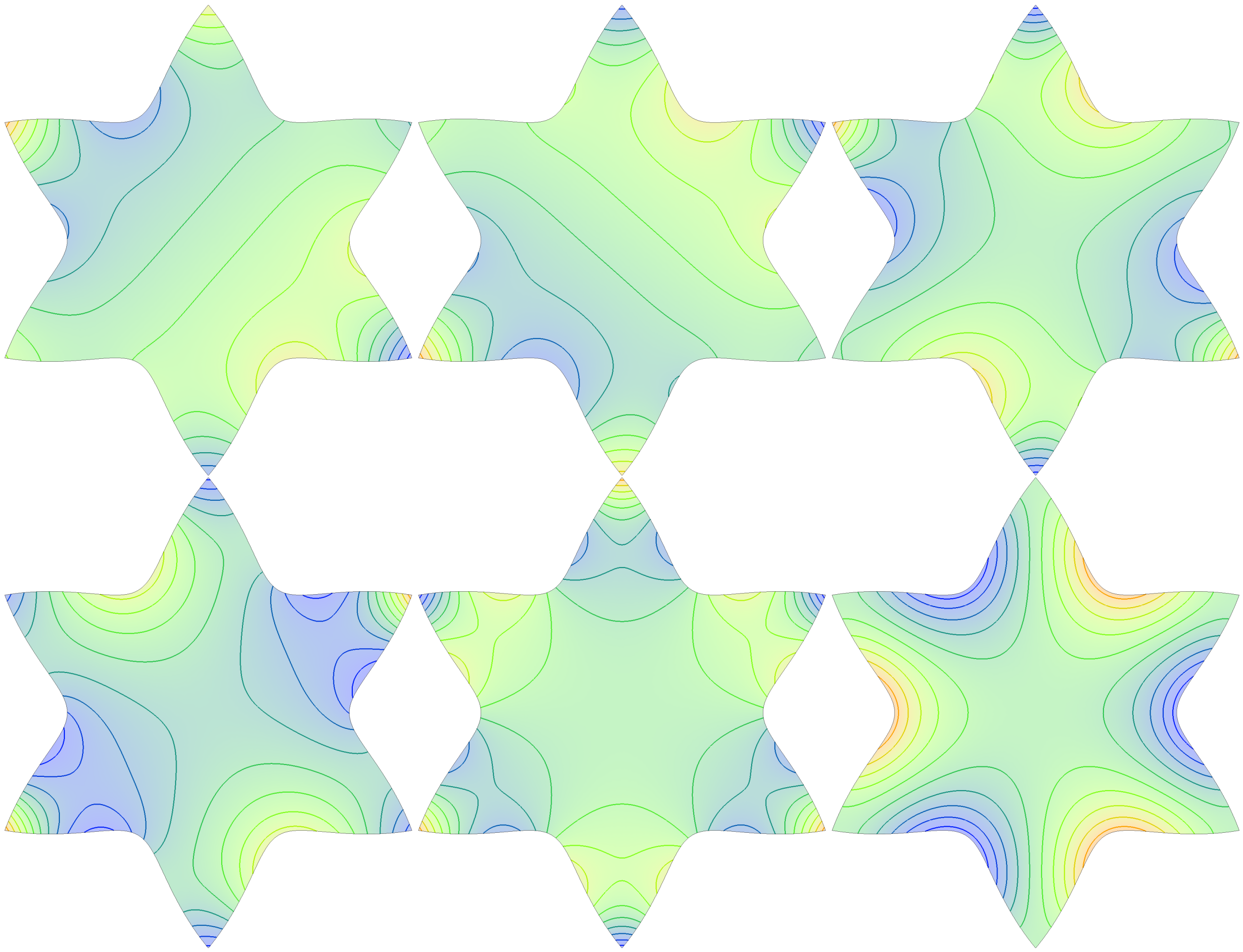
$$L = 6.8468308526 \quad g_0 = 2.10056111756 \quad g_1 = 1.08694410709 \quad g = 1.51102366901$$

1.2. Eigenvalues. Upper bounds are obtained by plugging numerical eigenfunctions into the Rayleigh quotient. Numbers in parentheses are numerical eigenvalues of the discrete problem. Finally ρ_i are the rescaled sums $(\sigma_1 + \cdots + \sigma_n)L$ on the domain divided by the same quantity on the disk.

$\sigma_1 \leq 0.719364691352$	(0.719364691298)	$\rho_1 = 0.783896721522$
$\sigma_2 \leq 0.719364696213$	(0.719364696158)	$\rho_2 = 0.783896724171$
$\sigma_3 \leq 1.08819044344$	(1.0881904434)	$\rho_3 = 0.688400541092$
$\sigma_4 \leq 1.08819046795$	(1.08819046792)	$\rho_4 = 0.656568484517$
$\sigma_5 \leq 1.19793505941$	(1.19793505939)	$\rho_5 = 0.582756566287$
$\sigma_6 \leq 3.44687769099$	(3.44687769114)	$\rho_6 = 0.750074646451$
$\sigma_7 \leq 4.194416074$	(4.19441607392)	$\rho_7 = 0.848223763004$
$\sigma_8 \leq 4.19441612076$	(4.1944161208)	$\rho_8 = 0.907113235484$
$\sigma_9 \leq 5.07123882461$	(5.07123882455)	$\rho_9 = 0.94673716109$
$\sigma_{10} \leq 5.07123887726$	(5.07123887719)	$\rho_{10} = 0.973153113406$
$\sigma_{11} \leq 5.8780815262$	(5.87808152622)	$\rho_{11} = 0.988888328866$
$\sigma_{12} \leq 6.06231707104$	(6.06231707128)	$\rho_{12} = 1.00490783415$

1.3. **Plots of eigenfunctions.**





1.4. **Sizes of mesh triangles and list of other parameters.**

Initial polygon: 24 sides. Adaptive: try to find 4 eigenfunctions, use at most None. Refine to at least 400000 triangles.

Sizes of mesh triangles after adaptive refinement (blue - small):