nels=2
nels=4
nels=8

$\frac{1}{8}$ $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$ $\frac{5}{8}$ $\frac{3}{4}$ $\frac{7}{8}$ 1

p=2
p=4
p=8

nels = 4
p = 4

nels = 8
p = 8

nels = 4
max. polynomial degree
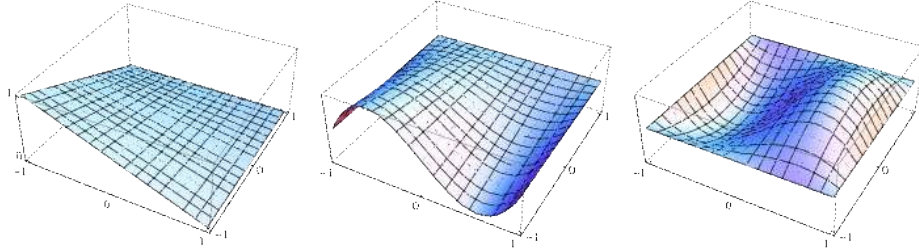on element p = p
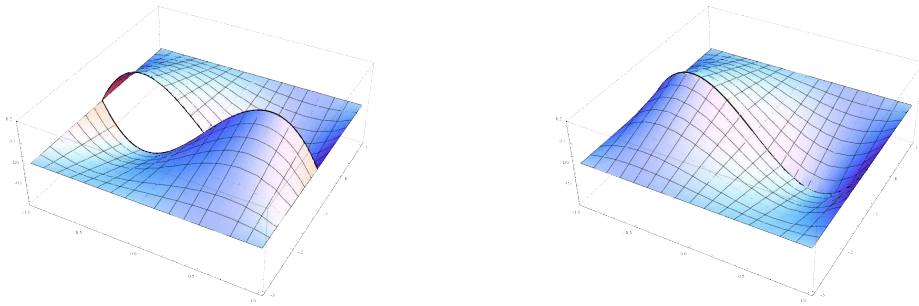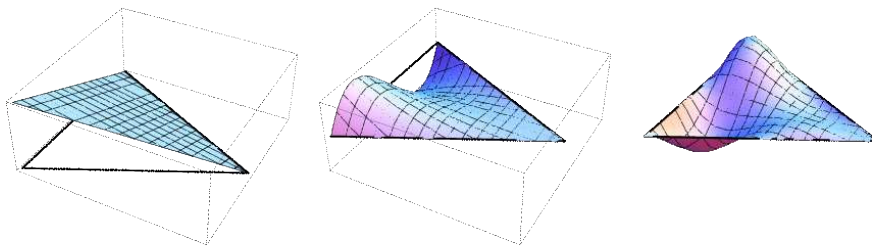geometric refinement with q=0.15
ndofs = 10

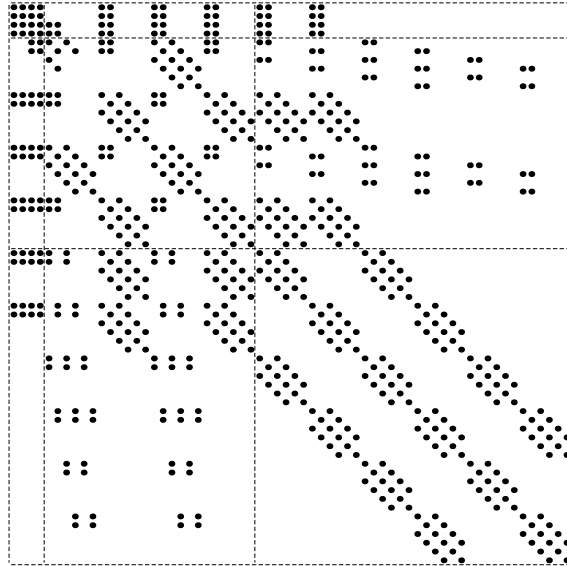vertex, edge and cell based basis functions on reference element $[-1, 1]^2$:

edge based basis function on two neighbouring quadrilateral elements without and with taking care of orientation:

vertex, edge and cell based basis functions on reference element $\hat{T}$:

mass matrix entries for hierarchic Legendre-type basis on the reference element $[-1, 1]^2$:

stiffness matrix entries for hierarchic Legendre-type basis on the reference element $[-1, 1]^2$:

Φ_Q

matrix condition number
   of stiffness matrix
w.r.t. polynomial degree

Lagrange

Legendre